2018 / volume 30 / number 1

ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The magazine of the Orthopaedic Section, APTA

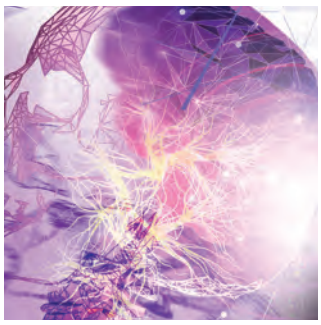
FEATURE:

Insidious Onset of Upper Extremity Lymphedema in a Patient with Chronic Shoulder Pain and Juvenile Idiopathic Arthritis: A Case Report

APTA
American Physical Therapy Association

PHYSICAL THERAPY MANAGEMENT OF CONCUSSION

Independent Study Course 28.1



Learning Objectives

1. Describe the signs, symptoms, biomechanics, and pathophysiology of a concussion.
2. Cite key risk factors for sustaining a concussion and indicators leading to prolonged recovery following concussion.
3. Describe common clinical profiles seen following concussion.
4. Discuss the role of biomarkers in the evaluation and management of concussion.
5. Understand negative consequences of poor concussion management.
6. Describe important guidelines for return to play following sport-related concussion.
7. Discuss the advantages and disadvantages of various concussion prevention strategies.
8. Select evidence-based tools and outcome measures for clinical evaluation and treatment of concussion.
9. Apply key examination and assessment methods for cervical/thoracic spine, vestibular/oculomotor system, and exertion following concussion.
10. Appreciate the role of neurocognitive testing in concussion evaluation and management.
11. Identify clinical profiles and treatment strategies for each concussion subtype: cervical, vestibular, ocular, mood, migraine, and cognitive/fatigue.
12. Describe important indicators for return to activity following concussion.
13. Discuss the role of sleep in concussion management, and employ interventions that can be used to modify sleep dysregulation.
14. Appreciate the influence of psychogenic factors in concussion management.
15. Describe common pharmacologic and non-pharmacologic treatment options for specific symptoms following concussion.

Description

This monograph series provides in-depth coverage for the evaluation and treatment of concussion by a physical therapist. The authors are recognized clinical experts in the field of concussion management. The basic pathophysiology underlying concussion is presented and then coupled with essential and advanced examination techniques. Special emphasis is placed on examination of the cervical and thoracic spine as part of concussion assessment and treatment.

For Registration and Fees, visit orthoptlearn.org
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Sharon Klinski—Managing Editor

Topics and Authors

The Basics of Concussion
Anne Mucha, PT, DPT, MS, NCS
Cara Troutman-Enseki, PT, DPT, OCS, SCS

Physical Therapy Evaluation of Concussion
Anne Mucha, PT, DPT, MS, NCS
Cara Troutman-Enseki, PT, DPT, OCS, SCS
Tim Ryland, PT, EdD(c), MPT, OCS, CBIS

Advanced Concussion Management
Anne Mucha, PT, DPT, MS, NCS
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ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The magazine of the Orthopaedic Section, APTA

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OPTP Mission

To serve as an advocate and resource for the practice of Orthopaedic Physical Therapy by fostering quality patient/client care and promoting professional growth.

Publication Staff

Managing Editor & Advertising
Sharon L. Klinski
Orthopaedic Section, APTA
2920 East Ave So, Suite 200
La Crosse, Wisconsin 54601
800-444-3982 x 2020
608-788-3965 FAX
Email: sklinski@orthopt.org

Editor
Christopher Hughes, PT, PhD, OCS

Associate Editor
Rita Shapiro, PT, MA, DPT

Book Review Editor
Rita Shapiro, PT, MA, DPT

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ORTHOPAEDIC SECTION DIRECTORY

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OFFICERS

President:
Stephen McDavitt, PT, DPT, MS, FAAOMPT, FAPTA
207-396-5165 • scfmpt@earthlink.net
2nd Term: 2016-2019

Vice President:
Lori Michener, PT, PhD, SCS, ATC, FAPTA
804-828-0234 • lmichene@usc.edu
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615-465-7145 • wellborn@comcast.net
1st Term: 2015-2018

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813-974-6202 • Aklein1@health.usf.edu
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304-293-0264 • dsdavis@hsc.wvu.edu
1st Term: 2016-2019

Explore the Orthopaedic Section website at: orthopt.org

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Office Personnel

(608) 788-3982 or (800) 444-3982

Terri DeFlorian, Executive Director
x2040.....tdeflorian@orthopt.org

Tara Fredrickson, Executive Associate
x2030..... tfred@orthopt.org

Leah Vogt, Executive Assistant
x2090.....lvogt@orthopt.org

Sharon Klinski, Managing Editor
x2020.....sklinski@orthopt.org

Laura Eichmann, Publishing Assistant
x2050..... leichmann@orthopt.org

Brenda Johnson, ICF-based CPG Coordinator
x2130..... bjohnson@orthopt.org

CHAIRS

MEMBERSHIP
Renata Salvatori, PT, DPT, OCS, FAAOMPT
904-854-2090 • Nata.salvatori@gmail.com
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314-286-1400 • bloomn@wustl.edu
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Christopher Hughes, PT, PhD, OCS, CSCS
724-738-2757 • chughes42@zoominternet.net
Term ISC: 2007-2019
Term OP: 2004-2019

ISC Associate Editor:
Gordon Riddle, PT, DPT, ATC, OCS, SCS
gordoncriddle@hotmail.com
2nd Term: 2017-2020

OP Associate Editor:
Rita Shapiro, PT, MA, DPT
Shapiro.rb@gmail.com
1st Term: 2017-2020

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703-527-9557 • mhshepherd@gmail.com
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507-293-0885 • cieslak.kathryn@mayo.edu
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JOSPT
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guy.simoneau@marquette.edu

Executive Director/Publisher:
Edith Holmes
877-766-3450 • edithholmes@jospt.org

NOMINATIONS
Judith Woehrle, PT, PhD, OCS
623-572-3921 • jwoehr@midwestern.edu
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Members: *Brian Eckenrode, Carol Courtney*

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2017 House of Delegates Representative –
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ICF-based CPG Editor –
Guy Simoneau, PT, PhD, FAPTA
414-288-3380 • guy.simoneau@marquette.edu
1st Term: 2017-2020

ICF-based CPG Editor –
Christine McDonough, PT, PhD
603-653-3565 • cmm@bu.edu
2nd Term: 2016-2019

Special Interest Groups

OCCUPATIONAL HEALTH SIG
Lorena Pettet Payne, PT, MPA, OCS
406-581-3147 • lpettet@aol.com
2nd Term: 2016-2019

FOOT AND ANKLE SIG
Christopher Neville, PT, PhD
315-464-6888 • nevillec@upstate.edu
1st Term: 2016-2019

PERFORMING ARTS SIG
Annette Karim, PT, DPT, OCS, FAAOMPT
626-815-5020 ext 5072 • neoluvsonlyme@aol.com
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PAIN MANAGEMENT SIG
Carolyn McManus, MSPT, MA
206-215-3176 • carolynmcmanus24@gmail.com
1st Term: 2017-2020

IMAGING SIG
Charles Hazle, PT, PhD
606-439-3557 • crhazl00@uky.edu
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ANIMAL REHABILITATION SIG
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2nd Term: 2016-2019

Education Interest Groups

PTA
Jason Oliver, PTA
lsu73lsu73@yahoo.com

President's Corner

What is in a Name Change? Section or Academy What is the Difference?

Within this issue of *Orthopaedic Physical Therapy Practice*, our Practice Chair, Kathy Cieslak, PT, DScPT, MEd, OCS, has provided a document addressing your Board of Director's highest recommendation to Section members to approve a name change of our organization from the Orthopaedic Section to the Academy of Orthopaedic Physical Therapy. I strongly recommend that all members read that information and refer to it when we put forward the request for a membership vote to approve our name change to Academy of Orthopaedic Physical Therapy at CSM in February 2018.

In 2013 the APTA House of Delegates adopted a landmark new vision for the profession of physical therapy. *"Transforming society by optimizing movement to improve the human experience."* This new vision directed the profession externally as opposed to internally as had been previously prescribed by Vision 2020. To complement the vision within external recognition initiatives across Section governance and outside APTA, over the past 5 years the Council of Section Presidents have been working together with the APTA Board of Directors, components, and staff on two related objectives.

1. Clarify the role of the Sections as content experts and resources to the Association.
   a. Section to lead: practice guidelines, education, collaborative advocacy, professional development, Special Interest Groups, research/evidence-based practice, awards, and mentoring.
   b. APTA to lead (with Section collaboration): Initiatives across government affairs, public relations, specific membership development, leadership development, and payment.
2. Develop a structure and process in which Sections have regular/ongoing input into the Association profession decision-making, including board, house, chapters, and staff.
   a. Support for Sections having a vote and greater representation in the House of Delegates.
   b. Increase collaboration communication with other Sections, Chapters, and APTA.

As the Orthopaedic Section moves forward to complete these and other collaborative objectives related to the visions of both APTA and the Orthopaedic Section within and outside of APTA and the profession, we need to think about our desired distinctiveness for value spanning a variety of roles and responsibilities within various service opportunities. In appreciation of this, the Orthopaedic Section Board of Directors feels the term "section" which refers to "a part that forms something" dilutes our looked-for reference as [the] experts promoting excellence in orthopaedic physical therapy. The limited classification as a "Section of APTA" therefore does not properly identify us with our vision, mission, or desired roles and responsibilities any longer. As Kathy Cieslak points out, *"An academy is an APTA membership group focused on the science, advancement, and practice of physical therapy in a clearly defined clinical practice arena. Academies support the vision of the profession and the mission of the association."* As we move outside of our section serving across other elements of governance, practice, education, research, and advocacy within APTA as well as interacting with other outside stakeholders within and outside our profession, our identity is more associated with an Academy as opposed to a Section. The Orthopaedic Section Board of Directors therefore feels being classified as an "Academy" best defines our organization, and we therefore urge the membership to consider and accept the name change from being known as the "Orthopaedic Section" to being known as the Academy of Orthopaedic Physical Therapy.

To be clear, in terms of governance, all Sections who thus far completed the formality to change their name to "Academy" and those who do so at some point in the future, still remain Sections of APTA. It is only their names that have been or will be changed to "Academy." Currently the list of Sections that have changed to an Academy include the Academy of Acute Care Physical Therapy, Inc., Academy of Clinical Electrophysiology Wound Management, APTA, Inc., Academy of Geriatric Physical Therapy, Inc., Academy of Hand and Upper Extremity Physical Therapy, APTA, Inc., Academy of Neurologic Physical Therapy, Inc. and Academy of Pediatric Physical Therapy, Inc. The following Sections on Aquatics, Education, Oncology, Orthopaedics, and Sports are all considering a name change from Section to Academy pending APTA approval and vote by the respective Section memberships.

When considering your vote, I hope you will read Kathy's excellent and informative document (see page 49) and along with other resources that will be provided to you on our website (orthopt.org) and within upcoming *Osteo-Blasts*. Speaking on behalf of your Orthopaedic Section Board of Directors and staff, we look forward to hearing your thoughts, sharing in dialogue, and reconciling your vote in addressing this recommendation for a change in the name of our cherished organization.

The best to you all in 2018!

Sincerely,

Stephen McDavitt, PT, DPT, MS
Fellow, Academy of Orthopaedic Manual Physical Therapists
Catherine Worthingham Fellow, APTA
President, Orthopaedic Section, APTA

Editor's Note

The Role of Us and the "Home" Exercise Program

Christopher Hughes, PT, PhD, OCS, CSCS

The home exercise program (HEP) is frequently an expected but often overlooked part of care. As physical therapists, we know it can be the difference in patient success if adhered to and done in sync with traditional physical therapy visits. However in reality we often are faced with challenges.

I am sure you can relate to these statements:

- *"Honestly I haven't done my home exercises because I don't have time."*
- *"I forgot how to do the exercises."*
- *"I lost the exercise sheet."*
- *"I think I did too much of my home exercises."*
- *"I can just do the same things here that I do at home."*
- *"No one has updated my home exercise program since the evaluation."*

In an investigation of exercise programs and the chronic low back pain patient, Palazzo[1] states many barriers can impede an unsupervised program. Some reasons cited were number of exercises, the effectiveness of the program, complexity of the program, the burden of exercising, and difficulties in planning time to organize exercise. Some of these factors are on us to remedy. We have to not only be respectful but also realistic of the patient's abilities and design programs accordingly. Just because we are pro-exercise does not mean that patients enjoy it, especially if we do a poor job rationalizing its importance.

Good clinicians know that it is far more productive to not just try and administer treatment 2 to 3 days per week. When done correctly, we can teach the patient how to self-administer an exercise program that adds improvement daily rather than solely relying on 2 to 3 days per week of supervised visits at the clinic. As we all know, today's health care restrictions and high co-pays are slowly chipping away at even this less than ideal frequency.

A multitude of factors go into creating the ideal HEP. We certainly prioritize the diagnosis and level of healing but that can be the easy part of program design. Other critical factors affect compliance. One is patient personality, while the other is time. Often both of these influences can be revealed on the initial visit. In many instances, we immediately know from our initial interview whether a patient will be compliant based on time and personality. In contrast we often worry about the "overzealous" patient who would overdo the program we design and they in fact become their own obstacle in the way of getting better. These are the type of patients who inevitably think more is better and end up taking a well-designed conservative program progression and double or triple the intensity and frequency. The lack of attention to detail by the patient can also be a pitfall. Many patients often forget about the little nuances we teach them about how to do exercises properly. Suddenly the exercise instruction we spent so much detail on during their last visit looks nothing like what they demonstrate on the next visit! This is a common scenario of correctly prescribing exercise but faulty execution. Ultimately physical therapists are accountable to not only what exercises we prescribe but also the instructions (advisement) on how to do them. Exercise "dosing and instruction" are critical although we leave patients to their own judgments even though they are not rehabilitation professionals.

This brings us to supervision. Is it critical or is it not? A quick search of the recent literature reveals a few studies that have addressed supervised vs unsupervised programs.[2-4] Feger and colleagues[2] conducted a review of supervised rehabilitation versus home exercise in the treatment of acute ankle sprains. They were surprised that there were just 4 randomized controlled trials (RCTs) comparing the effects of supervised rehabilitation with HEPs in patients with an acute ankle sprain. Interestingly, the authors point out that it is common for competitive athletes to undergo supervised rehabilitation several times per day while recovering from an acute ankle sprain. However only 11% of ankle sprain patients in the general population underwent supervised rehabilitation within 30 days of their ankle sprain diagnosis. Despite this discrepancy, both groups appear to have similar long-term outcomes at longer follow-up periods.

A recent systematic review by Coppola and colleagues[3] found that in select young and healthy populations supervised physical therapy is no more beneficial than a HEP following relatively simple knee surgical procedures (arthroscopic meniscectomy). However, this conclusion may not apply to older populations with co-morbidities or for more complicated knee surgical procedures (ACL reconstruction, total knee arthroplasty). Furthermore, the authors cautioned that some of the "unsupervised" protocols still had therapists introducing the home program or playing a role. The authors of this systematic review cautiously advised that such generalized conclusions need to truly match study methodology in order to correctly evaluate what is supervised versus unsupervised models of care.

In another study by Coulter and colleagues,[4] the outcomes in response to rehabilitation after total hip replacement were found to be clinically and statistically similar whether the program was supervised or not. The results suggest that early rehabilitation programs can be effectively delivered unsupervised in the home to low-risk patients discharged home after a total hip replacement. However a further review of the study methodology indicates that in-patient physical therapists delivered immediate care and were available to the home-based group as they continued their exercise program through telephone for the duration of the study. In addition, patients were contacted by a physical therapist for their follow-up reassessments. So in essence physical therapists still played a role.

Now, what about dispensing the HEP? For those of us who have been around before the software exercise program era began, the biggest challenge was selecting exercise cards or even worse, depending on our artistic skills at drawing stick figures of exercises for the patient! Please let's not revisit that period!

Enter the new technology age. Today companies can supply apps on mobile devices that take a person through his own program and also log in the workouts. No matter if it is a cloud-based subscription service or derived from a desktop computer, patients have a slight edge in bringing these programs to life so that they can improve compliance and in some instances track the data back to the clinic. New technologies meet these chal-

lenges and seem attractive to patients but they inevitably are not a substitute for the human relationship between patients and care providers.[1] Despite these technological advances one still has to "sell it" and that gets back to the heart of what we do best with our patients; face to face interaction and the gaining of trust and competence so that the patient has confidence and recognizes the importance. In contrast, if we just slap together exercises and never make them a real part of the treatment plan, then no technology in the world can dress it up right. In the end, like so much of what we do, there needs to be a partnership built on trust and professionalism.

In a twist to the application of technology, the benefit may not be what we provide to patients but what we take away from them. For the patient with chronic low back pain, maybe it is not about administering exercises but tracking postural habits with a wearable device. Wearables that track posture give us more than a snapshot in time of how a patient moves throughout the entire day. Identifying this type of posture and movement microtrauma may be more productive than only relying on exercises from a HEP to bring relief.

No doubt as new health care models rapidly evolve, physical therapists will once again be compelled to adapt. We will be asked to apply our unique skill set to new roles and new technologies. In the end, new technologies may cause a professional uneasiness but I believe there will also be new opportunities to highlight our skills. Ultimately there is no substitute for the bond that naturally occurs between patients and health care providers.

When we do our job, patients view the care we deliver and the programs we advocate as an extension of our sincere desire to partner with them and get them back to health!

REFERENCES

1. Palazzo C, Klinger E, Dorner V, et al. Barriers to home-based exercise program adherence with chronic low back pain: Patient expectations regarding new technologies. *Ann Phys Rehabil Med*. 2016;59(2):107-113. doi: 10.1016/j.rehab.2016.01.009. Epub 2016 Apr 1.
2. Feger MA, Herb CC, Fraser JJ, Glaviano N, Hertel J. Supervised rehabilitation versus home exercise in the treatment of acute ankle sprains: a systematic review. *Clin Sports Med*. 2015;34(2):329-346. doi: 10.1016/j.csm.2014.12.001. Epub 2015 Feb 14.
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4. Coulter C, Perriman DM, Neeman TM, Smith PN, Scarvell JM. Supervised or unsupervised rehabilitation after total hip replacement provides similar improvements for patients: a randomized controlled trial. *Arch Phys Med Rehabil*. 2017;98(11):2253-2264. doi: 10.1016/j.apmr.2017.03.032. Epub 2017 May 12.

2018 Annual Orthopaedic Section Meeting

Renaissance Baltimore Harborplace Hotel | Baltimore, MD

Don't miss this opportunity to learn from the experts in both pain science and movement science! Given the vision of APTA related to the movement system and the explosion of information related to pain science, what could be more cutting edge?

Please join us in **Baltimore, Maryland,** for the 6th Annual Orthopaedic Section Meeting, April 27 - 28, 2018. Physical Therapists and Physical Therapist Assistants will have an opportunity to learn from and engage with experts in the field of pain science and movement science. In addition, participants will be able to spend time with the leadership of the Orthopaedic Section.

We have made a slight change to the format of our 2018 meeting, as we will now be kicking off our meeting on Friday morning, April 27th. Our "welcome reception" will now take place on Friday night, in hopes that all registrants will be able to attend!

The focus of this 2-day conference will be the integration of the most current knowledge of **pain science** with movement science applied to the **low back, hip, knee, and shoulder.** Each day begins with a general session attended by all participants, followed by smaller breakout sessions led by the speakers. These sessions are intended to allow case-based, advanced application, and hands-on experiences related to the topics presented. New this year is a panel discussion at the end of both days to discuss, debate, and integrate the content delivered at the course.

Program Information

Friday, April 27, 2018

Friday Schedule: 8:00AM – 5:30PM | General Session: 8:00AM – 10:30AM

Structuring Non-Pharmacological Pain Management Delivered by Physical Therapists
Speakers: Steven Z. George, PT, PhD, FAPTA; Kathleen Sluka, PT, PhD, FAPTA; Stephen T. Wegener, PhD, ABPP

Concurrent Breakout Sessions:

Following the general session on Friday, **three** concurrent breakout sessions will be offered. The registrant will attend **all three breakout sessions** following the morning general session, based on order of preference indicated on the registration form. Note, individuals registering early will receive priority with selecting their order of attending these breakout sessions.

Breakout Session 1
Identification of Pain Mechanisms in Patient Populations
Speaker: Kathleen A. Sluka, PT, PhD, FAPTA

Breakout Session 2
Put Psychologically Informed Practice in Action – Tips for Exercise and Activity Prescription
Speaker: Steven Z. George, PT, PhD, FAPTA

Breakout Session 3
Patient Engagement Skills: Improving Engagement, Improving Outcomes'
Speaker: Stephen T. Wegner, PhD, ABPP

Learn More

The 2018 Annual Orthopaedic Section Meeting will be held at the beautiful Renaissance Baltimore Harborplace Hotel in Baltimore, Maryland. Visit the following link for full meeting details, to register, and to reserve your guestroom: *https://www.orthopt.org/content/s/2018-annual-orthopaedic-section-meeting*

ORTHOPAEDIC SECTION

Saturday, April 28, 2018

Saturday Schedule: 8:00AM – 5:30PM | General Session: 8:00AM – 10:30AM

Addressing Pain Problems Through the Use of Movement Science
Speakers: Skulpan Asavasopon, PT, PhD, OCS; Marcie Harris-Hayes, PT, DPT, MSCI; Phil McClure, PT, PhD, FAPTA; Linda Van Dillen, PT, PhD, FAPTA

Concurrent Breakout Sessions:

Following the general session on Saturday, **four** concurrent breakout sessions will be offered. The registrant will **attend three out of four breakout sessions** following the morning general session, based on order of preference indicated on the registration form. Note: space is limited, and therefore the attendee's breakout session assignments will be given on a first-come, first-serve basis.

Breakout Session 4

Classification that Drives Rehabilitation with Consideration of Relationships between Pain, Movement, and Muscle Activation: Practical Strategies and Techniques for Management of Common Shoulder Problems
Speaker: Phil McClure, PT, PhD, FAPTA

Breakout Session 5

Intra-articular, Prearthritic Hip Disorders and the Movement System
Speaker: Marcie Harris-Hayes, PT, DPT, MSCI

Breakout Session 6

A Cognitive-Biomechanical Approach to Knee and Low Back Pain – How to Do It?
Speaker: Skulpan Asavasopon, PT, PhD, OCS

Breakout Session 7

Implementing Skill Training in the Treatment of People with Low Back Pain: The Why and the How
Speaker: Linda Van Dillen, PT, PhD, FAPTA

Insidious Onset of Upper Extremity Lymphedema in a Patient with Chronic Shoulder Pain and Juvenile Idiopathic Arthritis: A Case Report

Lauren Riccardi, PT, DPT, OCS, CSCS

Hospital for Special Surgery, New York, NY

ABSTRACT

Background and Purpose: A 26-year-old female presented with an 8-year history of left neck and shoulder pain with radiating pain to her fingers, and insidious onset of upper extremity lymphedema, present for 4 months. **Methods:** The physical therapist used a variety of edema management techniques to reduce the chronic swelling in her arm, including manual lymphatic drainage, retrograde massage, compression, and diaphragmatic breathing. **Findings:** Following intervention, the patient presented with decreased left upper extremity circumference throughout, except in her dorsal hand. Cervical range returned to full in all motions except extension, and shoulder strength improved to symmetrical bilaterally. QuickDASH score improved from 67 to 42. **Clinical Relevance:** Insidious onset lymphedema without a history of cancer or trauma is rare. There is little evidence to guide successful treatment. **Conclusion:** The results suggest that manual edema management with compressive therapy, and improving strength and range of motion can improve function in individuals with insidious onset lymphedema.

Key Words: lymphatic drainage, manual edema management

INTRODUCTION

Swelling is a typical body response to injury or surgical procedure, and is part of the inflammatory phase of healing. Other characteristics of this phase include heat, redness, pain, and loss of function.[1] Typically swelling lasts less than 7 days, and is composed of electrolytes, white blood cells, and water that are easily reabsorbed by the body. Swelling can be divided into effusion and edema. Effusion is fluid inside of a joint capsule, whereas edema is fluid accumulated in tissue, outside of a joint capsule.[2] Consequences of edema can include increased pressure on nociceptors in the area, leading to pain, as well as inhibited muscle firing, and development of compensatory movement patterns. Acute swelling typically responds well to the RICE protocol.[2-5]

Lymphedema is the chronic stage of edema, and is defined as abnormal accumulation of protein-rich fluid in the interstitial tissues, often secondary to trauma or damage to the lymphatic system, specifically the lymph nodes. It is the result of a functional overload of the lymphatic system.[6,7] The lymphatic system is a one-way pathway that works along with the circulatory system in order to maintain fluid homeostasis. It is activated by light pressure, movement, muscle action, and diaphragmatic breathing, which creates a negative pressure system and assists fluid flow, as per Starling's principle.[2-4,6,8-11] The lymphatic system has 3 main functions: (1) immune function and support, (2) transport of fatty acids to the bloodstream, and (3) maintenance of fluid homeostasis and prevention of fluid backup. This system is responsible for 90% of excess interstitial fluid reabsorption. When this system is damaged or backed up, and lymphatic fluid accumulation exceeds the system's transport capacity, it can lead to lymphedema. Lymphedema typically affects the extremities.[8,9,11,12] Due to high protein content, this swelling is thick and viscous, making it difficult to be reabsorbed by the body. If left untreated, the swollen extremities become indurated and fibrous thus causing limb heaviness, pitting of the skin, limited motion of the surrounding joints leading to further increased pain, and discomfort.[7]

Diagnosis of lymphedema is often made based on clinical examination findings and a thorough review of the past medical history.[6] Some authors report diagnostic criteria of a 2 cm difference in circumferential measurements of the involved limb versus the uninvolved limb, or a 200 mL difference via water displacement or the truncated cone formula. Due to the time consuming, less portable, and potentially non-hygienic nature of the water displacement method, many clinicians choose to use circumferential measurements, which have been shown to be almost equally as valid as the gold-standard water displacement method; however, they are not interchangeable.[7,8,12,13] There are 3 types of lymphedema: primary, secondary, and insidious. Primary lymphedema occurs with a developmental defect to the lymphatic system, and can be congenital, praecox (occurring after birth but before age 35), or tardum (onset after age 35). Secondary lymphedema occurs due to an extrinsic factor damaging the lymphatic system, such as a tumor or subsequent radiation, or surgery. Insidious onset lymphedema is very rare, and is the onset of lymphedema without known damage to the lymphatic system.[14]

CASE DESCRIPTION

The patient was a 26-year-old female, who presented to the physical therapy clinic with a prescription for adhesive capsulitis and shoulder arthralgia. The patient's past medical history includes glaucoma and juvenile idiopathic arthritis (JIA). She received physical therapy for same until about 5 years ago, and was being followed and treated by the rheumatology department of the same hospital as the physical therapy clinic.

Regarding the shoulder pain, the patient reported injury to the left shoulder initially occurred 8 years ago when she internally rotated and extended her shoulder while putting on a backpack. She felt a "click" followed by pain and tingling into the left upper extremity. She reported since that time, in an effort to alleviate pain and discomfort she had been avoiding using her left upper extremity. An MRI of the cervical spine and shoulder showed an intact labrum and no muscle tears, with the spine and shoulder structurally intact, and a small C5-6 disc herniation without nerve root impingement. The patient reported a constant 7/10 pain on the numerical scale, and radiating to all fingers with motion of the left arm. The patient also had swelling of the entire left upper extremity that she reported began suddenly approximately 4 months prior to presenting at the clinic with no history of additional trauma.

EVALUATION

Physical examination revealed that the patient shifted away from the painful left upper extremity, with head and cervical spine shifted right. The patient reported about 20% decreased sensation throughout her left arm in C5, 6, and 7 nerve distributions. Two point discrimination and reflexes were intact. A positive Spurling's test was demonstrated on the left side, and a positive upper limb tension test, median nerve bias, reproduced the patient's symptoms of tingling. Tenderness to palpation was positive in the upper trapezius, levator scapulae on the left, as well as over the left acromioclavicular joint.

Active range of motion of the cervical spine revealed restrictions in all motions, most notably into cervical extension, where the patient protracted her chin and shifted her gaze upward rather than extend the lower cervical spine. Passive range of motion was difficult to assess at this time due to patient apprehension, severe guarding of neck, and reported tingling and pain in the left arm.

The patient had 100° of left active shoulder flexion, with trunk extension compensation, and 75° of left shoulder abduction using right lateral flexion compensation. She reported pain and tingling with any active movement. Passively, the patient had full range of motion in all planes of motion of the shoulder; however, the patient demonstrated severe guarding of her neck and shoulder, and reported tingling sensation in the left upper extremity. All manual muscle tests of her left arm were painful; therefore, the therapist could not accurately record grades beyond "weak, painful." Grip strength was measured to be less than 3 kg for her left hand, compared to 15 kg for the right hand.

Initial upper extremity circumferential measurements were performed at the patient's eighth visit when her neck range of motion was less guarded. The measurements were as follows: right upper arm (10 cm proximal to elbow) 29 cm, right elbow 26 cm, right forearm (10 cm distal to elbow) 22 cm, right wrist 15 cm, right hand (measured approximately midway between thumb joint and proximal interphalangeal joints) 18 cm. The left arm was as follows: left upper arm 32 cm, left elbow 29.5 cm, left forearm 25 cm, left wrist 18 cm, left hand 22 cm (Table 1).

The patient's goals included painfree motion of her arm and neck so that she could cook meals for her family and return to her hobby of baking. She also wanted to increase her shoulder and arm strength so she could return to school as a student to learn to be a research lab technician.

Table 1. Initial Circumferential Measurements

	Right	Left	Difference
Upper Arm (10 cm proximal to elbow)	29 cm	32 cm	3 cm
Elbow	26 cm	29.5 cm	3.5 cm
Forearm (10 cm distal to elbow)	22 cm	25 cm	3 cm
Wrist	15 cm	18 cm	3 cm
Hand	18 cm	22 cm	4 cm

At the conclusion of the evaluation, the patient was referred back to her doctor to assist her in scheduling appointments regarding the insidious onset of lymphedema. All imaging and vascular studies came back negative for any underlying pathology. The referring physician recommended continuing physical therapy based on shoulder pain and weakness, as well as for lymphedema care. The patient opted to receive care for her lymphedema and neck/shoulder in physical therapy. The patient was co-treated with the clinic's certified lymphedema specialist for 8 of the 26 patient visits.

INTERVENTIONS

Due to multiple impairments resulting from systemic and musculoskeletal etiologies a team approach was necessary. The patient was advised to follow-up with her rheumatologist to update her medications and treatments of her JIA since this condition contributes to prolonged synovial joint inflammation, joint damage, and pain. She was also educated on the importance of a consistent, up-to-date medical regimen to decrease joint pain, and to make it easier to treat the soft tissue concerns of the neck and shoulder, increase range of motion, and eventually begin to treat the insidious lymphedema.

The first 7 patient visits focused on a combination of cognitive behavioral therapy and postural re-education techniques. The therapist educated the patient in the importance of regaining motion and strength in the neck and left upper extremity, and also explained the pathophysiology of lymphedema and that the lack of upper extremity range of motion was inhibiting the action of the lymphatic system. Lymph flow relies on pressure from muscle contraction as well as negative pressure from movement. In addition, the patient was educated that the presence of pain was partly due to the lack of use over the years, and the tingling was a side effect of the swelling, which also inhibited muscle firing.[2] She was assured that the pain would decrease as the range of motion and strength improved. The patient was gently encouraged to use and move the arm, at first in painfree ranges of motion using assistance, and that her pain would decrease as strength and range increased. She was instructed in supine, active-assistive range of motion activities, such as forward flexion with contralateral hand assist, and abduction and external rotation with cane assist, in order to introduce motion to the shoulder and gentle active assisted range of motion for cervical flexion, extension, lateral flexion, and rotation. The patient was strongly advised to do these exercises at home as well. These sessions also included gentle soft tissue massage for the patient's upper trapezius, levator scapulae, sternocleidomastoid, and scalenes, and general soft tissue massage and craniocervical distraction aimed at relieving pain and decreasing guarding of the cervical spine. The patient was to practice proper upright posture with neutral spine in sitting positions, to decrease the right lateral shift of her cervical spine.

The patient regained full passive shoulder range of motion within 5 weeks, and was henceforth progressed similar to a rotator cuff repair protocol, with deltoid and rotator cuff strengthening below 90° abduction, rhythmic stabilization activities, and scapulohumeral control exercises, progressing to overhead activities once she demonstrated good scapulohumeral rhythm. See Table 2 for treatment protocols. Grip strengthening on the left was initiated using a foam ball to facilitate the grip strength improvement to within norms for females aged 20 to 29 which is about 30 kg.[15] The patient was encouraged to make behavioral changes at home, such as grasping and holding objects with the left hand, and using the left hand to open doors, pour liquids, etc. The patient continued to complain of tingling into the digits of her left hand, but it is this author's opinion that the tingling was due to stretching of nerves at the brachial plexus, secondary to weakness of the shoulder, and excess

Table 2. Treatments

Weeks	Soft tissue massage neck and cervical spine	Passive ROM cervical spine and left shoulder	Active-assisted ROM cervical spine and left shoulder	Postural Re-education	Isometric activities for neck and rotator cuff	Thera-Band scapular retractions, shoulder extension, isotonic neck strengthening	Grip/Grasp with foam, putty, towels. Using left arms in ADLs	Lymphedema compression, diaphragmatic breathing, manual edema mobilization	General RTC protocol (Thera-Band resistance exercise, humeral head stabilization, Air-Dyne ergometer	Functional shoulder strengthening (scaption, weightbearing stabilization, lateral pull down, dumbbell row, IR/ER at 90° abduction, etc)
1-3	X	X	X	X						
3-5	X	X	X	X	X					
5-7				X	X	X	X	X		
7-9				X		X	X	X	X	
9-12				X		X	X	X	X	
12+				X			X	X	X	X

Abbreviations: ROM, range of motion; ADLs, activities of daily living; RTC, rotator cuff; IR, internal rotation; ER, external rotation

weight of the arm due to the lymphedema. The tingling diminished over the course of the treatment for lymphedema.

On the patient's 12th scheduled visit, week 7, co-treatment with the lymphatic specialist was started with education on the need for full compliance with all programs, as management can often become a lifetime maintenance activity. The therapists used a variety of edema management techniques to reduce the chronic swelling in the left arm, including active motion, diaphragmatic breathing, compression, retrograde massage, and manual lymphatic drainage.

Lymphedema management began with teaching the patient diaphragmatic breathing techniques. Diaphragmatic breathing creates a vacuum effect in the lymphatic system, which helps lymph flow from peripheral to central vasculature and return to the venous system.[2] It is also an integral part of manual edema mobilization, which will be discussed in detail.

The patient was given a variety of chip bags to be used in conjunction with compressive wrappings to help reduce compressive edema. Chip bags are made of small pieces of multi-density foam in between two layers of fabric (Figures 1 and 2). Chip bags promote neutral warmth, which causes an enzymatic reaction to help break down indurated tissue present in lymphedema.[12] Along with tissue softening, they also provide dynamic, prolonged, light compression when placed under low stretch bandaging. The patient's arm was wrapped in a low stretch bandage (Figure 3). Low stretch bandages are rolled on, and provide a light counterforce to muscle contraction, recoiling only about 20% which helps keep lymphatics open.

Manual edema mobilization (MEM) was completed each session, starting at week 7, until discharge, and the patient was taught self-mobilization techniques as part of a home exercise program. Manual edema mobilization is a technique based in traditional manual lymphatic drainage principles except that it is used with intact lymph nodes. Based on all body scans and tests being negative, as mentioned in the patient case portion of this paper, the lead physical therapist and the co-treating therapist made the educated guess that MEM would work. Manual edema mobilization is not appropriate for primary or secondary lymphedema because extensive re-routing of the lymph is not accomplished.[2,12] Manual edema mobilization involves the affected limb only, and has unique hand massage patterns in the shape of a "U." It is also unique as it requires exercise after each segment is massaged to take advantage of the negative pressure created by active muscle pumps. Light massage is performed, with about 10 to 20 mHG pressure (not enough to collapse lymphatics). Massage is performed proximal to distal to clear the segment, then distal to proximal to move lymph, using a flat, relaxed hand on the skin. The hand creates gentle traction on the skin to create pressure changes.[2,3,6,12] After each section of the hand, forearm, and upper arm were massaged, the patient performed active range of motion exercises. After each session was complete (about 15 minutes per session), the patient used the upper extremity ergometer. The patient completed the manual therapy at home, 1 to 2 times per day for at least 15 minutes, followed by exercise, and then re-wrapped her arm in compressive bandages.

Outcome Measures

The patient was given the Disabilities of the Arm, Shoulder, and Hand (DASH) outcome measure tool at evaluation, 5 weeks, 10 weeks, and at discharge. The DASH is the most common tool used for assessment of the shoulder, and is used as a self-assessment of the symptoms and function of the upper extremity. It has been validated for clinical use in a multitude of studies with a minimal clinically important difference (MCID) that has been shown to be about 10 points.[17-20] Initially, the patient scored a 67. At week 5, she scored a 59. Then, at week 10, the patient scored a 44. At discharge, the patient scored a 42, which was more than double the MCID.

RESULTS

At discharge, the left upper extremity circumference measurements had improved by an average 2 to 3 cm at each level and were within 0.5 cm of the right upper extremity except the left hand (Table 3). The patient was independent in lymphedema management at home. Her cervical range of motion returned to full range in all motions except hyperextension, where she continued to

demonstrate aberrant motion. The shoulder strength improved from weak and painful on evaluation to symmetrical bilaterally 5/5 internal rotation, and 4+/5 shoulder extension. Shoulder flexion was 4/5 on the left and 4+/5 on the right, abduction 4+/5, left 5/5 right, and external rotation 4/5 left, 4+/5 right. The patient reported only occasional, minor tingling reaching her fingers which occurred primarily with end range shoulder flexion with neck rotation to the opposite side. The grip strength improved from < 3 kg on the left hand to 9 kg. The patient had achieved her goals of painfree motion, allowing her to return to cooking and baking (Figures 4-6). At discharge, she was planning to return to school.

DISCUSSION

This case report describes a unique case that, until now, has not been detailed in the literature. The patient had an insidious onset of lymphedema, and voluntary neglect of the left upper extremity. There was little evidence to explain the onset of lymphedema in this patient. It is this author's opinion that the lack of motion of the left arm contributed to the chronic swelling secondary to lack of muscle pumping action to assist the lymphatic system in returning fluid to the venous system. As the neglect continued, the arm became weaker and more painful when the weight of the extremity stretched the peripheral nerves. It appears that a combination of cognitive behavioral therapy, motor coordination and strengthening, and lymphatic management techniques contributed to improvement of function and motion of the neck and left upper extremity of this patient.

This approach was successful because of full patient compliance with the lymphedema management program. The patient wore her compression garments for 22 to 23 hours every day, and was diligent in completing her manual edema mobilization at home daily. The patient was compliant in all therapeutic exercise assigned for home. Her medication regimen prescribed by the rheumatologist helped keep her joint pain and baseline inflammation at a minimum. The results may differ for persons who do not comply fully with the program, as lymphedema has the potential for lifelong maintenance.[2,6,12] The general shoulder strengthening program worked not only to improve motion, strength, and function of the upper extremity, but also as a lymphatic drainage exercise with the muscles contracting to help create negative pressure encouraging lymphatic flow.

Figure 1. Chip bag for lower forearm, dorsal hand.

Figure 2. Chip bag sleeve.

Figure 3. Compressive bandage wrapping covered with thin foam.

Table 3. Final Circumferential Measurements at Discharge

	Right	Left	Difference
Upper Arm (10 cm proximal to elbow)	**30 cm**	**30 m**	**0 cm**
Elbow	26 cm	27 cm	1 cm
Forearm (10 cm distal to elbow)	**22 cm**	**22 cm**	**0 cm**
Wrist	15 cm	16 cm	1 cm
Hand	18 cm	19 cm	1 cm

CONCLUSION

Further research is needed into the treatment of insidious onset lymphedema, and subsequent management in the orthopaedic population. The techniques used for this patient could potentially be used in orthopaedic postoperative patients, such as total knee replacements, with increased swelling, to help decrease duration of swelling and improve range of motion and function more rapidly.

Figure 4. March vs. late April. Notice the decreased swelling in the phalanges, as well as increased wrinkles in the skin of the fingers and palm of the hand.

Figure 5. March vs. late April. Notice the increased wrinkles in the skin, indicating decreased swelling.

Figure 6. March vs. late April. Notice the significant difference in size of the left forearm from left to right, as well as the similarity in shape and size of the extremities in the picture to the right.

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The Use of Posterior Glide Mobilization and Sleeper Stretch on Glenohumeral Internal Rotation Deficit in an Adolescent Baseball Pitcher

Jeff Leatherman, MS, PT, DPT

PTA Program, South University-High Point, High Point, NC & Pivot Physical Therapy, Greensboro, NC

ABSTRACT

Background and Purpose: Glenohumeral internal rotation deficit (GIRD) is an acquired, often pathological physiological adaptation of the glenohumeral joint seen in many overhead throwing athletes. Research indicates that GIRD may be a contributing factor to a multitude of upper extremity injuries, especially as overuse injuries related to throwing are rising at exponential rates. Research also indicates that taking steps to address the range of motion limitations through joint mobilization and stretching exercises may have a positive impact on GIRD. The purpose of this case report is to describe the use of posterior glenohumeral mobilization and a "sleeper stretch" for GIRD in an adolescent baseball pitcher diagnosed with internal impingement of the throwing shoulder. **Case Description:** The patient was a 15-year-old male, right-handed high school baseball pitcher with a diagnosis of GIRD, scapular dyskinesia, and impingement. The patient received 8 visits of physical therapy including posterior glide mobilization, sleeper stretch, progressive resistive exercise, and cryotherapy in addition to a prescribed home exercise program and rest from throwing. **Outcomes:** Discharge values of range of motion, strength, pain, and overall functional status improved significantly, allowing the patient to return to competitive pitching with improved performance. **Discussion:** In addition to standard treatment options, posterior glide mobilization and sleeper stretch program should be considered as potential treatment options with adolescent baseball pitchers with GIRD and internal impingement. These mobilization and stretching techniques may have a positive impact on the overly stressed posterior glenohumeral capsule and soft tissue in preventing development of unwanted glenohumeral and scapular adaptations.

Key Words: shoulder, throwers, exercise, manual therapy

INTRODUCTION

Overuse injuries in baseball are very common. Such injuries in youth baseball are not only common, but are approaching epidemic proportions with exponential increases in upper extremity surgeries, debilitating injuries, and frequent reinjury.[1,2] Throwing a baseball, especially pitching, may be one of the most biomechanically demanding tasks in all of sports with the throwing arm in elite pitchers reaching an internal rotation velocity in excess of 7000°/second at the glenohumeral joint.[3] Wilk et al[4] describes the "thrower's paradox," as the "delicate balance between mobility and functional stability," which is frequently imbalanced and results in a host of potential injuries to the shoulder and surrounding tissues.

Researchers have well documented the adaptive phenomenon of a thrower's shoulder acquiring increased external rotation (ER), decreased internal rotation (IR), with a retention of the total range of motion (ROM) when compared to the non-throwing shoulder.[5-11] This pathologic loss of IR of the throwing shoulder, first described by Verna[12] in 1991 as "glenohumeral internal rotation deficit" (GIRD). Burkhart et al[13] describe GIRD as "the loss in degrees of glenohumeral internal rotation of the throwing shoulder compared with the non-throwing shoulder." Burkhart et al[14] later described that when compared to the uninvolved shoulder, an acceptable level of GIRD was less than 20° or less than 8° of total shoulder rotation.

In recent literature, several physiological causes of GIRD have been documented. It has been proposed that the loss of IR in the throwing shoulder is a result of posterior-inferior capsule contracture of the glenohumeral joint.[13] Tuite et al[15] analyzed magnetic resonance arthrography studies supporting the hypothesis that throwing athletes with GIRD and internal impingement symptoms tend to have a thicker labrum and a shallower capsular recess in the posterior inferior shoulder compared to non-throwers. Others propose there is a physiological osseous adaptation, or humeral retroversion, presenting as early as fourth grade,[16] that progresses over time in pre-pubescent throwers when the proximal humeral epiphysis has not completely fused.[17-19] There is evidence to suggest that rotator cuff and soft tissue hypertrophy with subsequent stiffness, also known as thixotropy, may also be a contributing factor to GIRD.[20,21]

Researchers have shown throwers with GIRD have more potential for injury to their throwing shoulders.[4,6] It has been proposed that this physiological adaptation may ultimately lead to pathological manifestations such as internal impingement, superior labrum from anterior to posterior (SLAP) lesions and/or rotator cuff pathology.[8,16,22,23] Impingement is one of the most frequently diagnosed shoulder conditions in overhead athletes.[24] Previously described as a diagnosis, impingement is today considered a term for a multitude of pathological mechanisms in the upper quarter, which can include rotator cuff pathology, scapular dyskinesia, shoulder instability, biceps/SLAP lesions, capsular restrictions, and GIRD.[25]

Specifically referring to GIRD, it has been documented that with tightness in the posterior capsule, there is an increased anterior translation and superior migration of the humeral head during shoulder elevation.[26-28] Grossman et al[29] reported that in throwers with GIRD, the humeral head is forced in a posterior and superior direction, which could exaggerate internal impingement and potentially, heighten the chances for rotator cuff lesions and/or SLAP tears. Myers et al[5] found throwing athletes with impingement demonstrated higher levels and increased frequency of GIRD. In addition, these athletes demonstrated increased tightness in the posterior shoulder compared to control subjects, thus leading to recommendations of stretching programs designed to address the posterior shoulder.

The manifestations of altered shoulder biomechanics are magnified by the repetition and speed of the throwing motion. As competitive youth sports become a more year-round effort with greater specializa-

tion, overuse injuries related to throwing and pitching have skyrocketed.[2] Meister et al[30] observed that the most dramatic decline in total shoulder rotation and elevation occurred between the ages of 13 and 14. Not surprisingly, this is also before the highest incidence of Little Leaguer's shoulder (proximal humeral epiphysiolysis due to overuse) at age 15 years of age.[30]

Identifying GIRD as a potential risk for these adolescent throwers and establishing early treatment guidelines is essential. Stretching and joint mobilization of the problematic posterior capsule have been studied at length with favorable results.[9,31,32] The "sleeper stretch" has been prescribed by physical therapists for its ability to stretch the posterior and inferior portions of the capsule and combat GIRD as studies have described its effectiveness.[13,33,34] In addition to self-stretching programs, passive mobilization techniques or "glides" are frequently used to help normalize restricted joint movements. In this case, where the posterior shoulder is the targeted region, many clinicians perform posterior glide techniques to the affected glenohumeral joint. Yu et al[35] found glenohumeral IR ROM and skin temperature of the posterior-lateral shoulder were significantly increased after posterior end-range mobilization techniques were performed. The purpose of this case study is to describe the use of posterior glenohumeral mobilization and a "sleeper stretch" for GIRD in an adolescent baseball pitcher diagnosed with internal impingement of the throwing shoulder.

CASE DESCRIPTION/BACKGROUND

As the subject was a minor, his mother signed a consent form for release of information as well as consent to treat. This allowed for review of the complete medical record to perform this case report.

Upon arrival to the physical therapy clinic, the patient and his mother completed additional paperwork including a patient demographic form and the Penn Shoulder Score (PSS), a functional index designed to assess patient self-report levels of pain, satisfaction, and function. The PSS is scored on a 0-100 scale with 0% indicating complete disability and 100% indicating no disability. In terms of reporting outcome measures of patients with various shoulder dysfunction, the PSS has been shown to be a reliable and valid measure.[36] It is the policy of this clinic to administer appropriate functional indices immediately prior to the initial evaluation and at discharge, to more effectively track patient outcomes and overall patient satisfaction. The initial PSS score for this patient was 70%, indicating a moderate level of upper extremity disability.

At the time of the initial physical therapy evaluation, the patient was a 15-year-old male, diagnosed by the referring orthopedic surgeon with "right shoulder internal impingement, GIRD, and scapular dyskinesia." The patient was a sophomore at a local public high school who participated in varsity baseball as a first and third baseman, but primarily as a right-handed pitcher. Over the past year, the patient competed in baseball over 9 months on various travel teams and weekend baseball showcase events. He reported he "quit playing basketball to concentrate on baseball." He normally pitched 1 to 2 times per week with various pitch counts ranging from 30 to 100 pitches per outing. His mother reported she noticed him "wincing in pain" when throwing a pitch with less than normal velocity 2 weeks prior. To help decrease the symptoms, the high school's athletic trainer recommended rest and over-the-counter non-steroidal anti-inflammatory medication (NSAIDs). After one week of rest, the patient reported experiencing similar pain after only 3 to 4 pitches. He described the pain as "sharp" and pointed to the anterior-lateral aspect of his right shoulder, indicating the pain moved distally down the lateral aspect of the upper arm. He rated the pain at 3/10 at rest and 10/10 just prior to releasing the baseball in the overhand throwing motion. Other overhead activities such as dressing and washing his hair also increased pain levels beyond 3/10. The patient reported rest from throwing, ice, NSAIDs, and sports cream massage were only somewhat effective in decreasing the discomfort.

At the recommendation of the athletic trainer, the patient consulted with the orthopaedist specializing in shoulders. Radiographs were ordered by the physician, which were reported negative by the reviewing radiologist. The orthopaedist recommended additional 4 weeks rest from throwing, prescribed Meloxicam, a prescription-strength NSAID, and referred to physical therapy for evaluation and treatment.

The patient denied any previous arm trouble or injury and denied any significant past medical history. Both the patient and his mother expressed a desire for the patient to return to throwing as soon as possible, as his first varsity baseball game was in 2 weeks.

INITIAL CLINICAL IMPRESSION

The evaluating physical therapist felt that the patient's and mother's motivation and eagerness to return immediately to competitive levels was not advisable. Furthermore, the referring physician had prescribed 4 weeks rest from pitching in addition to physical therapy and medication. While returning to competitive sports can be a great motivating factor for patients, returning prematurely before the proper rehabilitation is complete could result in further injury and additional time lost from competition. The patient had a follow-up appointment with the referring physician at the conclusion of 4 weeks.

Given the patient history and pain patterns, the initial clinical impression was of significant issues with the throwing shoulder, which could also be related to the rotator cuff. The SLAP lesion was only a remote possibility given the patient's age and lack of deep mechanical symptoms such as clicking, popping, or reference to glenohumeral instability. Muscle imbalance in the scapular region was also suspected. The evaluation plan was to focus on the source and degree of the inflammation and to differentiate between the rotator cuff versus subacromial lesions from overuse early in the baseball season.

EXAMINATION

The patient presented with a head forward posture and rounded shoulders. Tightness in the pectoralis regions was noted bilaterally. He demonstrated dyskinesis of the right scapular with excessive elevation, slight winging during active ROM testing, and asymmetry through observation.

Range of motion testing was performed and is presented comparing initial evaluation through discharge (Table 1). The patient reported pain at all end ranges of right shoulder active ROM. No pain or scapular dyskinesia were appreciated in the left upper extremity. Passive ROM of the right glenohumeral joint for IR and ER was tested in supine with shoulder in 90° of abduction and the elbow flexed to 90° with the scapula supported by the patient's body weight and the evaluating clinician's hand over the coracoid process to effectively stabilize the scapula (Figure 1). The patient demonstrated 90° of passive ER, with pain limiting the assessment of end feel and 45° of IR, limited by pain with a firm end feel. The uninvolved left shoulder demonstrated 95° of passive ER and 72° of passive IR, respectively. This constituted a starting point value of GIRD equal to 27°. Total arc of motion (total rotation) of the right shoulder was 135°, with the left shoulder 167°.

Manual muscle testing (MMT) has been used for decades in the field of physical

Table 1. Passive Range of Motion Measures for Both Shoulders: Internal Rotation and External Rotation at Initial Evaluation, Visit #4, and Visit #8 (Discharge Visit)

Passive ROM	Initial Evaluation	Visit #4	Visit #8 (Discharge)
Right shoulder ER	90°/painful	128°/no pain	135°/no pain
Right shoulder IR	45°/painful	68°/no pain	76°/no pain
Left shoulder ER	95°/no pain	Not tested	Not tested
Left shoulder IR	72°/no pain	Not tested	Not tested

Abbreviations: ROM, range of motion; ER, external rotation; IR, internal rotation

therapy to assess for muscular strength and torque. According to Hislop et al[37] validity and reliability for MMT are "satisfactory for clinical use but can never be *perfect* because of the subjectivity of the measures." Manual muscle testing was performed on both shoulders with the patient demonstrating 5/5 strength throughout the left upper extremity. The results of right shoulder MMT indicated weakness present along with pain elicited during resistive testing (Table 2).

Konin et al[38] in their book illustrate the Hawkins-Kennedy Impingement Test for external impingement of the shoulder, primarily the supraspinatus tendon, when the greater tuberosity contacts the undersurface of the acromion. They also describe the Neer Impingement Test, where pain and apprehension are indicative of shoulder impingement, primarily the supraspinatus and long head biceps tendons being compressed against the undersurface of the acromion. Both of these tests were positive during the initial evaluation. According to MacDonald et al,[39] for bursitis or rotator cuff lesion, these particular tests have sensitivity values of 88.9% for Hawkins-Kennedy and 77.0% for Neer. The specificity for Hawkins-Kennedy is 60.0% and Neer is 62.5%. The positive predictive value for Hawkins-Kennedy is 71.4%, Neer 70.0%. The negative predictive value for Hawkins-Kennedy is 82.8%, Neer 71.4%.

An additional special test performed at the initial evaluation was the Drop Arm Test, in which a positive finding is indicative of rotator cuff pathology.[38] The patient was able to slowly lower the upper extremity with control, but pain was noted. This was considered a negative test for a rotator cuff tear, but the pain provocation is noteworthy for possible tissue irritation. According to Calis et al,[40] the sensitivity value for this special test is 7.8% while the specificity is 97.2%. The positive and negative predictive values for the Drop Arm Test are 87.5% and 29.9%, respectively. Palpation of the right upper quarter revealed tenderness only at the rotator cuff insertion at the greater tuberosity. The special tests and palpation were performed at the conclusion of the initial evaluation as they can elicit pain and affect subsequent tests and measures in a negative manner.

Figure 1. Positioning for passive range of motion measurement of the right glenohumeral joint—internal rotation.

SECOND CLINICAL IMPRESSION

Based on the examination findings and overall observation of the patient's movement patterns, the examiner hypothesized that while there was an overuse injury to the rotator cuff, it did not appear to be a tear, but rather rotator cuff tendinopathy and subacromial tissue irritation. Addressing the tendinopathy as well as promoting rest and healing to the affected tissues was the primary focus of initial treatments followed by addressing ROM and strength deficits to allow the athlete to return to overhead throwing. To summarize the findings of the initial evaluation, the problem list included the following: pain and tenderness indicative of inflammation, decreased ROM/GIRD/total rotation, decreased strength, poor posture, scapular dyskinesia, and limited functional capacity including the inability to throw without pain (PSS initial score = 70%). Short-term goals to be met in 4 weeks included the following: demonstration of independence and compliance with the prescribed home exercise program, demonstration of improved postural awareness, a reduction in pain by >50%, full right shoulder active ROM without pain, and 5/5 MMT throughout the right shoulder. The long-term goal of return to competitive pitching was set at 8 weeks. The treatment plan included therapeutic exercise with eventual return to throwing program, manual therapy, including joint and soft tissue mobilization, massage, passive ROM, stretching, and proprioceptive neuromuscular facilitation (PNF), patient education, and modalities as needed.

INTERVENTIONS

The primary focus of the rehabilitation program was to reduce inflammation and promote healing of the inflamed tissues. The patient and his mother were educated on the healing process and the anatomy and physiology of the inflamed shoulder. The main advice being, "If it hurts, do not do it. Discontinue this activity." This advice was applied to the prescribed exercises, activities of daily living, and even sleeping posture. It was explained that pain with activity, especially in the subacromial region, was a det-

Table 2. Manual Muscle Testing of Right Shoulder at Initial Evaluation, Visit #4, and Visit #8 (Discharge)

MMT-Right Shoulder	Initial Evaluation	Visit #4	Visit #8 (Discharge)
Flexion	4/5 painful	5/5	5/5
Abduction	4/5 painful	5/5	5/5
ER	3/5 painful	4/5	5/5
IR	4/5 painful	5/5	5/5

Abbreviations: MMT, manual muscle testing; ER, external rotation; IR, internal rotation

riment to further healing and inflammation could continue in a vicious cycle in response to overstressing the involved tissue. It was imperative for this hyper-motivated patient and mother to understand this concept and it was expressed by the therapist on a regular basis.

Kuhn's[41] systematic review of interventions for rotator cuff pathology and shoulder pain suggest exercise can be an excellent option for physical therapists. Therapeutic exercise is certainly a broad term that can encompass many different methods and different goals of treatment. Initial exercises prescribed to the patient to encourage fluid exchange and increased blood flow, helping the healing process included ROM exercises such as pendulums and wand, very light resistive exercise such as an upper body ergometer. It was again emphasized that all activity, especially exercise, should be painfree.

The postural deficits were addressed with pectoralis stretching. The patient was positioned supine on top of a 6-inch diameter foam roll positioned vertically along the spine and move the upper extremities into abducted positions to hold for 30 seconds to help to reduce pectoralis shortening, hyper kyphosis, and thoracic hypomobility.[42]

Initial manual therapy for this patient began with grade 2-3 oscillatory joint distraction for pain relief, painfree passive ROM/stretch to address ROM deficits, massage to the posterior shoulder musculature to increase blood flow, as well as the introduction of grade 3-4 oscillatory posterior glides to address potential posterior glenohumeral capsule hypomobility. As a result of addressing the posterior tightness, it was hypothesized there would be an increase in internal rotation ROM, thus decreasing GIRD.

The posterior glenohumeral joint mobilization (Figure 2) was performed in supine with a small wedge positioned behind the patient's right scapula for stabilization and to slightly elevate and dissociate the glenohumeral joint from the scapulothoracic joint. The patient's right upper extremity was positioned in approximately 90° of elbow flexion, 90° of shoulder abduction, as well as approximately 90° of shoulder horizontal adduction. This position was altered as needed to avoid painful positioning and/or painful mobilization. The therapist placed his right hand on the right elbow of the patient, and stabilized his position with the left hand. The therapist's right forearm was in the same plane as the patient's upper arm to maximize the ability to effectively mobilize the posterior capsule. A downward force perpendicular to the floor was applied while continually communicating with the patient. The desired effect was a stretch to the posterior-lateral aspect of the right shoulder. This mobilization was performed for bouts of 10 to 20 seconds with oscillations at end range for 5 to 10 repetitions at various intensities based on the patient's input and therapist's preference.

By the third visit the patient's pain levels had decreased significantly as the impingement signs and palpation revealed very little inflammation, the sleeper stretch (Figure 3) was prescribed to the patient as part of the home exercise progression. The patient was instructed to perform the sleeper stretch in a painfree manner but feeling a firm stretch, 3 times daily, 30 second holds for 5 repetitions each set. As inflammation subsided and ROM improved in this patient's case, resistive exercises in the form of "Blackburn's exercises"[43] were initiated and added to the home program to strengthen the scapular retractors and rotator cuff musculature. Also included were right shoulder extension, horizontal abduction with external rotation (thumb up), and elevation in the scapular plane (thumb up). Each of these resistive exercises was performed in a prone position with the involved extremity off the side of the treatment table. The patient was instructed to perform this series of exercises with 3 to 5 pound hand weights, 10 to 20 repetitions of each exercise to fatigue, 2 sets of each, once daily. Other resistive exercises for scapular stability and rotator cuff strength and endurance training were closed chain "wall washes" with a compressible medicine ball, "serratus punches" using a medicine ball with the patient lying supine on the vertically positioned foam roll, seated press downs facilitating scapular retraction and depression. All of these exercises were performed in therapy sessions, 3 sets of each, to fatigue with progressive levels of intensity/resistance.

As the progression of the strength and endurance training continued, the efforts to increase the patient's available total shoulder rotation continued to be emphasized. As the subject's pain subsided, an increase in both IR, ER, and subsequently, total rotation of the throwing shoulder was observed (Table 1). At the beginning of the fourth visit, the patient reported that he did not have any pain, which made it easier to stretch and that the shoulder felt good but weak. As the patient continued to meet short-term goals, including painfree activity, appropriate strength levels, and improved ROM, overhead activities and plyometric exercises were added to the list of exercises performed in the clinic to more adequately prepare the patient for a return to throwing program. This included resisted internal and external rotation with the right shoulder abducted to 90° and elbow flexed to 90° and resisted PNF D2 upper extremity diagonals, both with resistive tubing at various speeds and intensities to better simulate the mechanics of throwing. These were added to the patient's home exercise program and were performed 3 to 4 times per week with a day off in between.

Ice was used as an anti-inflammatory and pain relieving modality at the conclusion of each treatment for 15 minutes to the right shoulder and at home, at the end of each day.

Figure 2. Posterior glide mobilization of the right glenohumeral joint.

Figure 3. Sleeper stretch.

OUTCOMES

The patient was seen 2 times per week for a period of 4 weeks prior to his recheck with the referring physician. At the final visit, the patient demonstrated excellent technique with all of the prescribed home exercises and presented with full and painfree active ROM, improved passive ROM with GIRD eliminated (see Table 1). Strength testing results demonstrated improved force production without pain during MMT (Table 2) and all shoulder special tests were now negative (Table 3). He had met all short-term goals established at initial evaluation and was able to perform throwing simulation drills specifically in preparation for his return to baseball and pitching. He scored 100% on the PSS indicating no disability and was formally discharged from physical therapy with recommendations to continue with his home program and to begin a graduated return to throwing upon clearance by the referring physician. His physician has his own return to throwing program that outlines the incremental dosages with the patient to properly build arm strength and endurance in a systematic fashion.

From a phone interview approximately 3 months after the beginning of physical therapy, the patient's mother reported that her son had completed the return to throwing under the guidance of his athletic trainer and began throwing off the mound without pain shortly thereafter. According to his mother, he was pitching well and completed the second half of his high school season throwing with an increased velocity by approximately 7 mph, demonstrating improved performance, and most importantly experiencing no pain.

DISCUSSION

This case report suggests that in addition to other identified treatment options such as rest and medications, posterior glide mobilization techniques and a sleeper stretch program should be considered when treating adolescent baseball pitchers with GIRD and external or internal impingement. As demonstrated in this case, these techniques may have a positive impact on the overly stressed posterior capsule and soft tissue, helping to alleviate development of unwanted glenohumeral and scapular adaptations.[44] The PSS score improved in terms of negated pain while improvements were noted in ROM, strength, endurance, and overall function. In overhead throwers who are in pain, it has been noted that the total arc of motion is decreased significantly.[45] As pain levels decreased in this patient, both IR and ER increased, resulting in more appropriate levels of glenohumeral total rotation for a baseball pitcher. The corresponding increases in velocity were likely secondary to regained total glenohumeral arc of motion in the throwing shoulder.

Kuhn's[41] review also favors manual therapy in conjunction with therapeutic exercise to achieve favorable outcomes. Similar to therapeutic exercise, there are countless methods of manual therapy available to physical therapists to help address the aforementioned deficits.

Significant increases in IR ROM were demonstrated in a group of college baseball players after participating in a daily stretching regimen for 12 weeks.[31] Acromiohumeral distance, a 2-dimensional measure for the subacromial space, was found to be smaller in athletes with GIRD on their dominant side. However, this distance was found to increase significantly after a 6-week stretching program, highlighted by the sleeper stretch.[32]

Most of the aforementioned studies that have investigated GIRD and its ramifications, have involved collegiate and professional level throwers. Given the increase in adolescent shoulder injuries in response to more frequent throwing, it seems appropriate to also investigate the younger population of throwers and pitchers. Further research on the actual physiological changes related to GIRD as well as further studies documenting the results from in-season stretching programs in youth baseball, would also be beneficial.

Preventing overuse in youth throwers and perhaps, overhead sports in general, could be the primary method to help prevent shoulder conditions such as GIRD and internal/external impingement that appear to arise from repetitive stress and strain of throwing and other biomechanically similar sports tasks.[44] Other upper extremity injuries may also be related to GIRD as recent studies have shown correlations between GIRD and elbow valgus instability.[45] In addition, young throwers with GIRD have 3 times the probability of recurrence of debilitating upper extremity injury compared to those without GIRD.[1]

Educating players, families, coaches, administrators, trainers, and other clinicians about limiting pitch counts and allowing for appropriate rest between pitching outings is vital to help decrease the frequency of these debilitating injuries. In addition, it is imperative to establish good communication between all parties involved to support this adolescent group of athletes. Evidence suggests youth baseball coaches lack the knowledge and compliance with USA Baseball guidelines as it relates to appropriate pitch limits and rest between pitching performances.[46,47] The harmful ramifications of GIRD could be potentially minimized if pitch count limits are enforced and throwing athletes are allowed to recover appropriately. This would include appropriate rest in between individual pitching outings during the season, as well as taking several months away from throwing during the off-season, as advocated by renowned orthopaedic surgeon, James Andrews, MD, the founding director of the American Sports Medicine Institute.[2]

One of the limitations in this study was the measurement of total rotation by the treating therapist. The technique to stabilize the scapula and perform a measurement with a goniometer made it difficult to accurately measure without using two therapists.

Another limitation of this study is other therapies including passive ROM, rotator cuff/scapular strengthening, and cryotherapy were used throughout this case. These additional interventions make it unclear if the patient's overall improvement was the result of the posterior glide mobilizations and sleeper stretch program or a combination of all of the interventions, including rest and the normal course of healing in an otherwise healthy adolescent. Further research and case studies are needed to help determine if these techniques should be used in isolation or if they should be combined with other available therapeutic options.

Table 3. Functional Index Scores, Special Tests Results at Initial Evaluation, Visit #4, and Visit #8 (Discharge)

Test	Initial Evaluation	Visit #4	Visit #8 (Discharge)
Penn Shoulder Score	70%	Not tested	100%
Hawkins-Kennedy	Positive	Negative	Negative
Neer's Impingement	Positive	Negative	Negative
Drop Arm	Negative, painful	Negative, no pain	Negative, no pain

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Addition of the Anterior Shear Test in Diagnosing Lumbar Segmental Instability: A Case Report

William Temes, PT, MS, OCS, COMT, FAAOMPT[1,2]
Steve Karas, PT, DSc, CMPT, OCS[1,3]
Emily Baughman, MPT, OCS, COMT, FAAOMPT[2]

[1]North American Institute of Orthopedic Manual Therapy, Eugene, OR
[2]Therapeutic Associates, Eugene, OR
[3]Chatham University, Pittsburgh, PA

ABSTRACT

Background and Purpose: Classifications systems, for those seeking physical therapy for low back pain, have been developed in an attempt to guide treatment and have improved outcomes. Emphasizing the importance of clustered findings including patient presentation, diagnostic imaging, and manual assessment in classification and clinical decision-making enhances care. **Methods:** A medical diagnosis of lumbar instability or spondylolisthesis, based upon standard radiographs, may suggest the need for subsequent flexion-extension radiographs to examine excessive translation. Using the manual anterior shear stress test while simultaneously measuring via C-arm fluoroscopy may provide additional data. **Findings:** The additional information gained by the manual assessment and radiological interpretation of the C-arm fluoroscopic image may lead to a diagnosis of segmental instability. **Clinical Relevance:** Use of the anterior shear stress test appears to be an important adjunct to other clinical and diagnostic findings. **Conclusions:** The anterior shear test may facilitate improved management of the patient with suspected lumbar instability even in light of contradictory imaging and additional pathologies. Further research is needed to investigate the validity and reliability of this test.

Key Words: fluoroscopy, low back pain, spine diagnostic testing

INTRODUCTION

Low back pain (LBP) is a common and costly condition, and a clinical enigma for medical professionals.[1,2] Because it is difficult to identify a specific pathomechanical cause, diagnosis and treatment using the traditional medical model has been challenging.[3-7] Classification of LBP results in more effective treatment and leads to improved outcomes.[8-10] It allows intervention to be designed for specific subgroups using clusters of signs and symptoms at times grouped into clinical prediction rules (CPRs).[9,11] Clinical prediction rules use a decision-making process where a combination of findings are statistical predictors of the presence of a condition. When used together, these tools improve clinical outcomes by matching patients to the appropriate treatment.[4,5,12-14]

Low back pain classification systems are similar to CPRs because a set of characteristics places patients into subgroups. One subgroup, the "stabilization" category, includes patients thought to have lumbar segmental instability who respond positively to stabilization exercise.[5,6,7,15,16] However, novice physical therapists (PTs) display significant interrater disagreement classifying patients according to the decision-making algorithm for the stabilization category.[13]

A CPR has been derived to predict the subgroup of patients with LBP who may benefit from stabilization training.[5,17-19] The patient characteristics include: age < 40, straight leg raise > 91°, positive prone instability test, and presence of aberrant motion. Because no true external reference or criterion standard exist, treatment outcome (ie, patients who respond positively to stabilization) and use of a CPR may be used as the criterion standard of inclusion into the instability subgroup.[17,20] More refinement and validation of the stabilization CPR is needed including larger sample sizes and randomized controlled trials.[17]

Clustering of information by combining the results of several reliable assessment procedures (including subjective, objective, and radiographic findings) with other data may be a solution for the lack of acceptable tests for lumbar instability. A test, although individually weak, has greater clinical utility within a cluster of other valid signs, symptoms, and history items.[21] Therefore, a lack of diverse evidence for validity may not mean that a test does not have clinical utility.

Defining Instability

When first presented in 1944, instability was thought to occur due to degeneration and failure of passive restraints that limit motion (vertebra, intervertebral disc, ligaments, facet joint capsule). A degenerative disc, which loses height, appears to lead to decreased passive restraints.[8,22-24] This may lead to spinal treatment in an attempt to stop excessive, painful translatory motion. However, osteophyte development, decreased disc space, and reduced range of motion changes have been demonstrated in asymptomatic individuals and radiological evidence of degenerative spondylolisthesis does not necessarily indicate instability.[23,25,26]

Although numerous perspectives on spinal instability exist, there is little agreement on clinical presentation and diagnostic criteria.[5] It typically involves an applied force producing motion greater than would occur in a normal spine resulting in pain, deformity, or compromise of neural structures.[6,17] Diagnosis of abnormal lumbar segmental displacement has focused on excessive motion at the end range quantified by flexion-extension radiographs.[3,8,24,27-30] The reference standards for the average amount of displacement for each lumbar segment appear arbitrary.[10,25,26,28,30,31] Additionally, variability of displacement and large range of normal movement in asymptomatic subjects makes these values difficult to validate.[10,11,23,28,30]

The biomechanical model of instability emphasizes the importance of spinal kinematics and abnormal displacement under stress.[6,7,26] Segmental stability is described as the interaction of the following subsystems: the passive subsystem (vertebral body, intervertebral disc and endplate, ligaments, facet joint and capsule, and passive tension of musculotendinous elements), the active subsystem (muscles and tendons surrounding the spinal column) and the neural control system including central nervous system, peripheral nervous system, and proprioceptive/kinesthetic receptor input.[6,7] The muscular and

neural control systems may compensate for loss of passive restraints provided they are not damaged.[6,32]

Detecting Instability

Subjective indicators of instability may include a sensation of giving way or locking, pain exacerbation with transitional movements, and recurrent episodes with poor treatment outcomes.[11,16,19,26,29] Observational findings include a vertebral "step-off," increased muscle tone, aberrant motions during weight bearing, instability catch sign, reversal of lumbopelvic rhythm, Gower's sign, pain with sit-to-stand test, and supine painful catch sign.[6,7,11,15,16,22,20]

Common manual tests employed to assess segmental stability are the standing posterior shear test, supine passive straight leg raise, passive lumbar extension test, and the prone instability test.[5,8,11,15,20,32,34] However, the validity, reliability, sensitivity, and specificity of these tests is not documented and there is poor interrater reliability.[11,16,17,20,21,33,35,36]

A more reliable test that physical therapists use is the anterior shear test which assesses the integrity of spinal structures that resist anterior shear, including anterior longitudinal ligament, posterior longitudinal ligament, "ligamentous" part of the annulus, ligamentum flavum, capsular ligaments, inter-transverse ligament, interspinous ligament, supraspinous ligament, superior part of the iliolumbar ligament, and posterior layer of thoracolumbar fascia.[3,30,36]

Using passive accessory intervertebral motion (PAIVM) to assess quantity of translation and quality of end-feel when excessive motion is suspected demonstrates predictive validity in making treatment decisions.[5,12,14,17,33,36] A literature review described PAIVMs as having modest diagnostic ability to assess structural lumbar segmental motion and therefore, they may have a role ruling in and out instability.[3,8,11,12,21,29,35] However, there is little reliability for PAIVMs assessing translation.[33] Landel et al reported a similar conclusion despite adding dynamic MRI for sagittal plane measurements of posterior-anterior mobility.[33,37]

Flexion-extension Radiography

Any single instability examination procedure alone typically has weak diagnostic value whether it is a manual assessment or advanced imaging.[2] Current instability diagnosis relies on flexion-extension radiograph confirmation.[8,11] Radiographs offer low cost, high spatial resolution and excellent bone definition, making them a common technique in spine imaging.[26] Lumbar flexion-extension radiographs are typically taken at the end of range.[27] Early analysis was done by manually tracing the image and measuring distances and angles. Modern computer-assisted methods are the diagnostic standard that analyze and measure displacement of each motion segment relative to the adjacent vertebra.[25,28,38,39]

Many limitations exist in the literature with respect to flexion-extension radiographs, and include varying patient positions, a lack of fixation, inability to reach end range of motion, radiation exposure, poor measurement reliability, reference standards variation, and excessive motion in asymptomatic subjects.[3,10,11,16,18,19,22,23,25,26,28,31,32,40] Excessive translation has also been found in asymptomatic patients; therefore, excessive translation at end-range may not be the only indication of instability. A decrease in neuromuscular control may cause instability in mid-range.[8] The anterior shear stress test attempts to examine the passive subsystem and quantify excessive translation at end-range and is not designed to assess mid-range abnormalities or motor dysfunction.

In spite of their limitations, flexion-extension radiographs continue to be the standard for surgical decisions. Excessive motion is considered by surgeons to be the cause of pain and surgical fusion is performed based on the belief that securing the segment will lessen symptoms.[23,25,40,41] Fusion surgery may predispose non-fused segments to the same degenerative processes that fusion attempts to alleviate.[40] The rate of lumbar spinal fusion is increasing rapidly in the United States despite uncertainties regarding indication for, and success of, the procedure.[3,23,40]

Anterior Shear Test

Due to the passive administration of the test, the anterior shear stress test performed under the C-arm fluoroscopy offers great clinical utility regardless of the results of flexion-extension radiographs even though literature has questioned the accuracy of independent clinical tests to diagnose instability.[11,33]

C-arm Fluoroscopy

A C-arm fluoroscope is an x-ray unit with a "C" shaped support structure between the x-ray tube and image intensifier (Figure 1). It allows for lower x-ray dose exposure by magnifying the intensity and clarity of the examined structure. Various cardiac, vascular, urologic, and certain orthopaedic procedures are performed under the C-arm fluoroscopic guidance. C-arm fluoroscopy permits the operator to rotate and angle the x-ray tube without moving the patient. This assists in real time dynamic images that are captured and stored for later analysis. The devices provide high resolution x-ray images in real time, allowing the physician to monitor progress during operations and immediately make any required corrections.

Physical therapists in clinics with a radiology department may have the opportunity to use C-arm to objectively measure the degree of hypermobility of the lumbar spine and compare it with measures of flexion/extension x-rays. A radiologist selects from one of the many images to find the one that demonstrates the greatest amount of translation and calculation is done with the same method as flexion-extension radiographs. In our medical center, radiologists collaborate with PTs using C-arm to assist in determining degree of spinal segmental instability using passive clinical ligament stress testing. Fluoroscopy as a standard measure of dynamic stability has not been used previously.[42-46]

CASE

A 46-year-old female presented to physical therapy from a local neurosurgeon with complaints of left (L), lumbosacral discomfort, anterior-lateral lower leg numbness, and weakness of the leg and foot. She had a 2-year history of LBP, exacerbated 3 months earlier while sleeping. Symptoms were worse with standing > 4 to 5 minutes and walking > 4 blocks. She found relief with forward bending movement and sitting. On clinical examination, she demonstrated restricted, aberrant lumbar extension and left side bend (LSB) with pain. She exhibited impairments in the motor and sensory distribution of L5 and S1 nerve roots and absence of her Achilles reflex. Passive straight leg raise was negative and < 90°. Posterior-anterior mobilization was positive for pain at L5, but the prone instability test was negative. A step off was noted at L5-S1.

Due to her reported history, despite lacking CPR agreement, an anterior shear stress test was performed and found to be positive for excessive anterior translation at L5-S1, at 70° and 90° of hip flexion, when compared with more proximal segments.

Imaging

Lumbar spine radiographs were obtained with the patient standing 40 inches from the source while images were taken in neutral, flexion, and extension. Using a picture archiving and communication system (PACS) the radiologist measured 13 mm

anterior spondylolisthesis of L5 on S1 in neutral (Figure 2). There was no demonstration of instability or additional translation in flexion (Figure 3) or extension. However, the anterior displacement of L5 relative to S1 was greater when compared to her MRI.

A C-arm fluoroscopic evaluation was performed during the anterior shear stress test. The patient lay on her side 6 inches from the edge of the bed with her hips and knees flexed 70°. The patient's knees were in contact with therapist's pelvis and the therapist controlled the patient's trunk with his cranial arm. The PT flexed the patient's hips until motion was appreciated at L5/S1 with the caudal arm and palpating interspinous space of L5/S1 with the index finger of the cranial hand. The PT stabilized the spinous process of L5 with digits 3 and 4 of both hands and pushed posteriorly through patient's knees along the line of her femur to feel for any additional anterior translation, pushing the inferior segment posteriorly on a fixed superior segment and expected a firm end-feel. The same procedure repeated with patient's knees/hips drawn up into flexion of 90°, assessing the effects of tightening the supraspinous ligament. The PT's impression was demonstrated by palpation and C-arm fluoroscopy of instability > 3mm of L5 on S1 with the anterior shear stress test (Figure 4).[38]

An MRI obtained after lack of improvement demonstrated L5-S1 foraminal stenosis compressing the L5 nerve root secondary to spondylolysis, spondylolisthesis (6 cm), and uncovering the disc at L5-S1.

RESULTS

In this case, a 46-year-old female office worker with undiagnosed, complex LBP, our manual assessment examination was confirmed by C-arm fluoroscopy despite negative flexion-extension radiographs. The PT demonstrated the presence of excessive motion without exposing the patient to excessive radiation by using short bouts of exposure during testing.

Physical therapist assessment using the anterior shear stress test contributed to further diagnostic information that was vital to making the next treatment decision. C-arm fluoroscopy confirmed the diagnosis of clinical and mechanical instability of L5/S1 which was not observed with flexion-extension radiographs or suspected using the CPR.

As with all case studies we acknowledge the limitations of the lack of patient variability, potential researcher subjectivity, and unknown external validity. However, with this case, we present a unique set of patient

Figure 1. C-arm device.

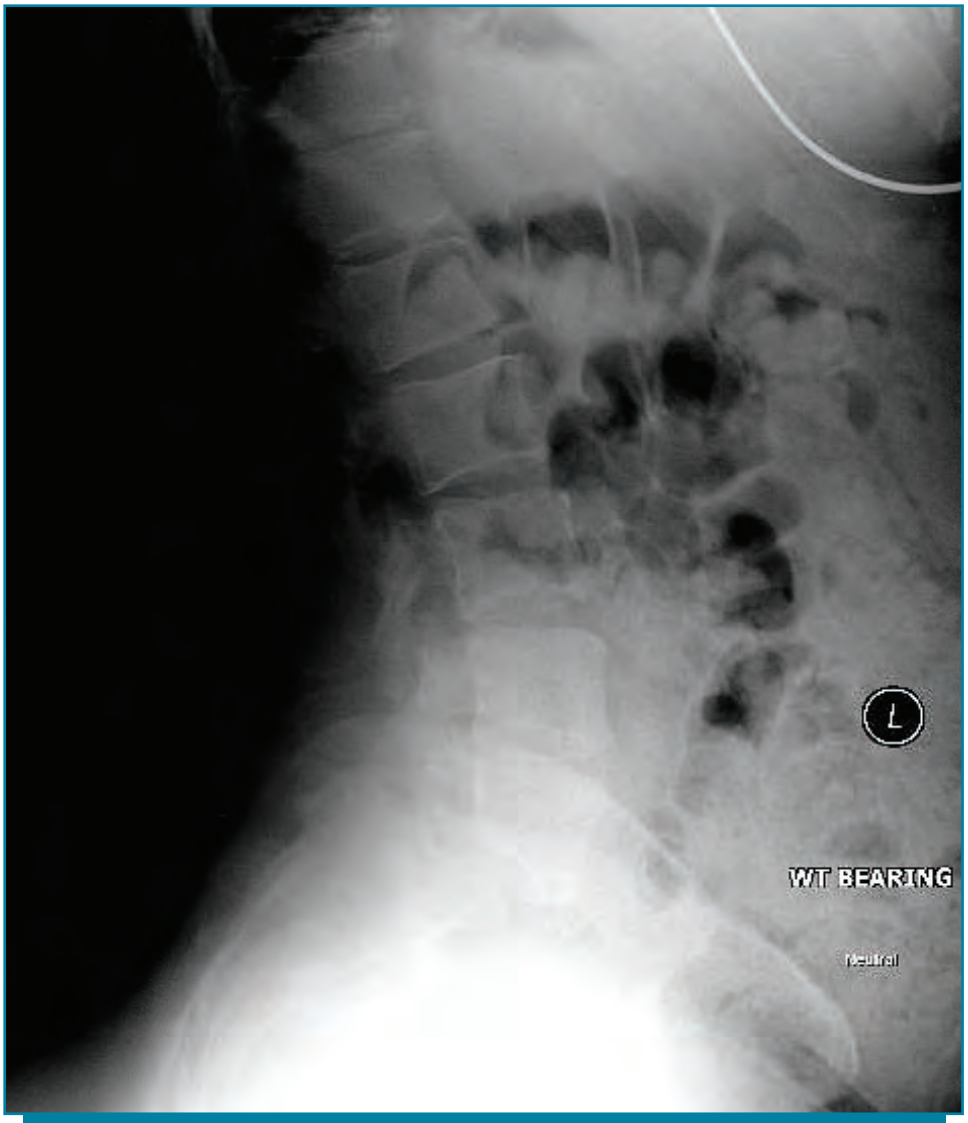

Figure 2. Neutral lateral x-ray.

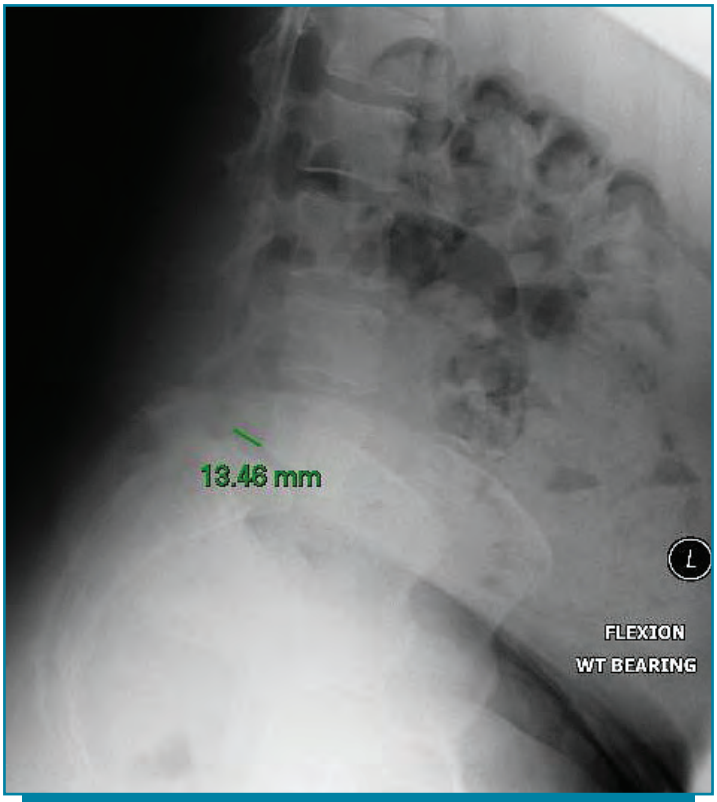

Figure 3. Flexion with measurement x-ray.

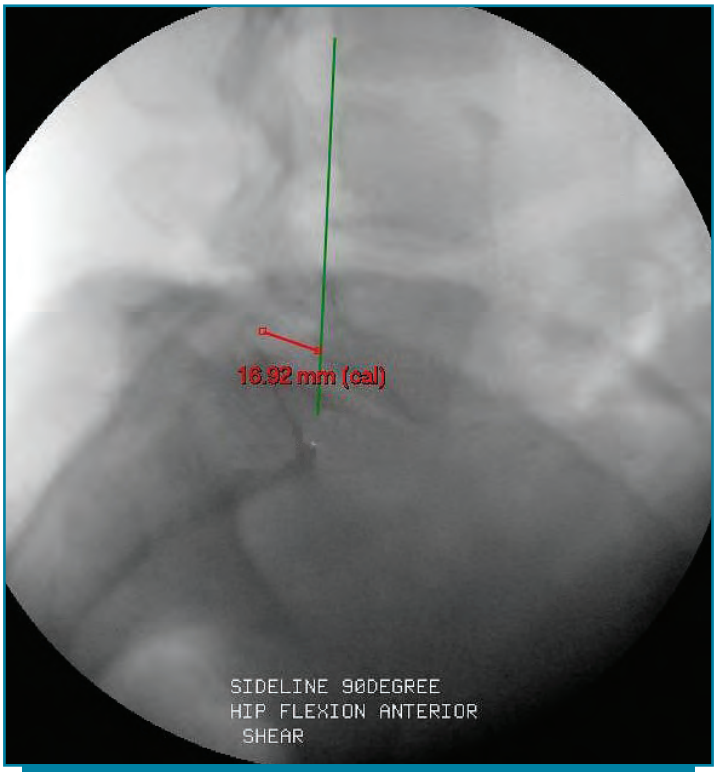

Figure 4. C-arm image.

characteristics and responses to imaging and manual assessment techniques. While our results may not be applicable to the entire population that may fit into this classification or CPR, we do suggest that the addition of the anterior shear test may guide clinicians in complicated cases of LBP where excessive motion is suspected.

DISCUSSION

This case demonstrates the difficulty of diagnosing lumbar instability in a complicated patient who did not fit into the stabilization classification or follow a CPR and do not demonstrate excessive translation with flexion-extension films. It is the author's opinion that patients may not be willing or able to move to end-range due to pain or muscle guarding and therefore flexion-extension films often produce false negative findings. This patient did have increased translation with manual stress testing using the anterior shear stress test, and it was objectively confirmed by C-arm fluoroscopy.

With no consensus guidelines for lumbar segmental instability currently in place the treatment is highly dependent on patient, PT, and physician preference. Controversy remains due to poor reliability and validity of clinical tests, lack of a true reference standard to confirm instability, and poor correlation between pain and spinal motion.[3,4,6,7,16,22,23,25,26] The value of functional flexion-extension radiographs is often inconclusive but their use as the gold standard to indicate surgical fusion continues.

Though it is important to assess and appropriately classify patients with lumbar instability, thus far there has been no consensus on reliable and valid clinical tests independent of imaging for lumbar spine segmental instability determination.[11,12,20] For a diagnostic test to be useful clinically, independent of imaging, it must have acceptable reliability so that clinicians expect consistent results.[8,11] Testing validity, may begin with identifying and describing the test in a case report.[32] Despite the negative findings on flexion-extension radiographs, we have demonstrated in this case that the anterior shear test was validated for instability using C-arm fluoroscopy.

Future research might examine clusters of subjective and objective findings, including manual assessment using the anterior shear test, of patients suspected of having lumbar instability and ensure such clusters are reliable and valid.[16,47]

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Retrospective Case Review Following Physical Therapy Treatment for Patients with Lateral Patellar Subluxation/Dislocation

Teresa Errigo Vitale, PT, DPT, OCS[1]
Brianne Mooney, PT, DPT[2]
Ashley Vitale, PT, DPT[3]
Demitra Apergis, PT, DPT[4]
Stephen Wirth, PT[5]
Mark G. Grossman, MD[6]

[1]*NYU Winthrop Hospital, Winthrop Physical Therapy, Garden City, NY*
[2]*NYU Lutheran Medical Center, Brooklyn, NY*
[3]*All About Kids, Plainview, NY*
[4]*NYIT, Old Brookville, NY*
[5]*Outpatient Rehabilitation and Sports Medicine, NYU Winthrop Hospital, Mineola, NY*
[6]*Department of Orthopedic Surgery, NYU Winthrop Hospital, Clinical Assistant Professor, SUNY Stony Brook*

ABSTRACT

Background: Incidences of patellar subluxation or dislocation have been documented up to 43/100,000. **Purpose:** To document the time course of physical therapy intervention for patients with this condition and to recommend guidelines for nonsurgical rehabilitation. **Methods:** Eight subjects treated in physical therapy for lateral patellar subluxation or patellar dislocation consented to anonymous utilization of their data from a chart review. **Results:** The mean Modified Cincinnati Knee Outcome Measure (MCKOM) was 90.8%, indicating a "good" to "excellent" post rehabilitation result for return to prior level of function. **Clinical Relevance:** This study describes the rehabilitative approach and functional outcome for patients with lateral patellar subluxation who have undergone physical therapy without surgical intervention. **Conclusion:** All 8 subjects returned to their sport/functional activity safely after a rehabilitation program that included proprioceptive and dynamic training in addition to a home exercise program.

Key Words: conservative care, Modified Cincinnati Knee Outcome Measure, proprioception

INTRODUCTION

Patellar dislocation or subluxation has an incidence rate of up to 43/100,000 with occurrence in females more prominent than males.[1,2] A review of the literature states that pathomechanics of the hip, knee, and ankle may predispose one to a patella that incurs hypermobility in the lateral direction. For example, femoral anteversion with compensatory tibial external rotation, genu valgus, and forefoot pronation are all mechanical factors that may play a role.[1] In addition, decreased flexibility in muscles and other soft tissue around the knee, especially the iliotibial band can place abnormal lateral forces on the knee. Patellar instability may also be related to weakness of the vastus medialis oblique (VMO), hip adductors, and overpowering of the vastus lateralis thus leading to the patellar lateral tilt and glide. A shallow trochlear groove in combination with patella alta can decrease the stability of patella femoral joint. The patella has also been found to be at a risk for lateral subluxation when the femur is externally rotated, tibia is internally rotated, and the knee is flexed at 0° to 20°, and a forceful contraction of the vastus lateralis occurs.[3,4]

Due to the soft tissue surrounding the bony anatomy of the femur, there can be a lack of patellar engagement in the femoral trochlear groove. This lack of engagement is seen between 0° and 20° where most patellar subluxations/dislocations occur. Within the ranges of 20° to 60° the patella is most stable due to the bony stability with the femoral trochlear. The medial and lateral femoral condyles form the trochlear groove with the lateral femoral condyle usually elevated anteriorly to counteract lateral forces.[4-7] A reduction in the depth of the trochlear groove can decrease resistance to lateral displacement of the patella. During the knee flexion range of 0° to 20°, the soft tissues are the primary restraints to lateral forces including the medial patellofemoral ligament (MPFL), which provides 60% of the restraint, along with the dynamic force of the VMO.[4,8] The adductor magnus with fibers connecting to the medial collateral ligament (MCL), VMO, and posteromedial capsule attach to the MPFL provide medial stability.[8-10] Due to being innervated, the MPFL has a proprioceptive role in the patellar mechanics.[1,11-13]

In 2014, Menetrey et al[11] discussed criteria for return to sport after patellar dislocation or following surgery. Specifically, for the conservative cases in their study, the authors felt a successful and safe return occurs when there is no limiting pain, no early re-injury, no further damage to the knee, return to prior injury or higher level, and still playing after 5 years. The return to sport decision is a process including a clinical examination, evaluation of laxity, strength measurement, and neuromuscular evaluation. These authors state that during the rehabilitation process the patient's program should focus on strengthening the quadriceps and pelvic stabilizers, specifically, the gluteus medius.[11] This study builds on rehabilitation principles for conservative treatment after lateral patellar subluxation and applies these principles to a select patient population.

OBJECTIVE

The primary purpose of this retrospective descriptive case series has 3 objectives:

1. Describe a timeline of physical therapy intervention for lateral patellar subluxation.
2. Determine the outcomes for return to sport or activity after physical therapy using the Modified Cincinnati Knee Outcome Measure (MCKOM).
3. To educate clinicians on progression criteria throughout physical therapy intervention.

METHODS

Participants

The inclusion criteria for this study were: male and female subjects, ages 10 to 34 years old, nonsurgical diagnosis of ICD 9 coding 836.3 or the ICD 10 codes of S83.011D and S83.012D of patella dislocation or subluxation. The exclusion criteria included any subjects that had previously undergone ligamentous and patella surgeries, realignment procedures, or MPFL reconstruction. The ICD-9 and ICD-10 coding will be gener-

ated from the REDOC 7.8 documentation system that is used in the facility.

Eight subjects with lateral patellar dislocation or subluxation consented to anonymous use of data from a detailed chart review of their physical therapy care. Six subjects were one time dislocators/subluxators. Subjects C4 and C6 reported multiple dislocations/subluxations. Subject C4 sustained her first subluxation during dance as a teenager and then had another occurrence performing the same activity. Subject C6 had multiple subluxations as a collegiate track athlete (Table 1). IRB approval was granted.

Table 1. Subjects Demographics

Diagnosis	Conservative	Age (years)	Gender	Single/Multiple Subluxation
Patellar Subluxation	C1	12	Male	Single
Patellar Subluxation	C2	20	Female	Single
Patellar Subluxation	C3	21	Male	Single
MPFL tear/ Subluxation	C4	34	Female	Multiple
Patellar Subluxation	C5	14	Female	Single
MPFL tear/Subluxation	C6	20	Female	Multiple
Patellar Subluxation	C7	10	Female	Single
Patellar Subluxation	C8	15	Female	Single
		Range: 10-34 Mean: 18.25	6 female/ 2 male	2 multiple/6 single subluxation

Abbreviation: MPFL, medial patellofemoral ligament

PROCEDURE

Using the Redoc 7.8 documentation note writing system, the staff obtained data through a detailed chart review of the subjects' physical therapy treatment from initial evaluations, progress notes, re-evaluations, and discharges. Photographs of one volunteer, with consent, were taken to illustrate the progression of physical therapy with proper technique and form. The physical therapy intervention of these subjects was performed by 4 physical therapy staff members with experience that ranged from 10 to 31 years. During the course of therapy, all subjects underwent the same guidelines of treatment. These guidelines can be found in Tables 2 through 4.

Subjects were asked to fill out a MCKOM post discharge anytime from 62 to 164 weeks after their injury. This measure is designed to inform the therapist on how the patient's knee pain is interfering with their function. The MCKOM is a functional questionnaire that reflects the patient-reported subjective information with a maximum score of 100.[14-16] It consists of 8 sections: Section 1-Pain intensity (20 points), Section 2-Swelling (10 points), Section 3-Giving way (20 points), Section 4-Overall activity level (20 points), Section 5-Walking (10 points), Section 6-Stairs (10 points), Section 7-Running activity (5 points), and Section 8-Jumping or twisting (5 points). Four of the sections the authors felt were most important to analyze for safe return to sport/functional activity included Section 3, Section 4, Section 7, and Section 8.[14-16]

TEST AND MEASURES

Table 1 displays the diagnosis, age, and gender of the conservatively treated subjects. Range of motion (ROM) measurements in Table 2 were taken according to Norkin and White using a baseline goniometer.[17] The immobilization and bracing requirements per physician referral are noted in Table 2. The progression for weight-bearing status is depicted in Table 2 in part based on physician instruction. The transition of non-weight-bearing (NWB) exercises to advanced strengthening program is noted in Table 3. The timeline for return to sport or functional activity and the total length of physical therapy treatment is outlined in Table 4. This timeline maps out the progression from static to dynamic proprioceptive activity, running, plyometrics, sport specific drills, and return to a sport or functional activity. The follow-up MCKOM scores are displayed in Tables 5 and 6. Table 7 discussed the proposed guideline based on the findings of this study.

RESULTS

As presented in Table 1, the ages ranged from 10 to 34 years old including 6 females and 2 male subjects. The data collection for the subjects in the following tables was depicted in weeks from the time of injury. Table 2 showed the average length of time to reach over 120° of knee flexion was 5.3 weeks. Seven subjects were able to obtain full knee extension between 2 and 13 weeks from injury with an average of 5.4 weeks. Subject C4 was documented with genu recurvatum and C8 extension was not documented. Table 2 showed that the average length of time for immobilization of the knee was 4.2 weeks. The average length of time, 4.8 weeks, to reach full weight bearing (FWB) is depicted in Table 2. Table 3 demonstrated the progression from NWB (average 3.6 weeks) exercises, adductor strengthening (average 4.5 weeks), and advanced strengthening exercises (average 5.5 weeks). Table 4 recorded the timeline for return to sport/functional activity with the average time being 15.28 weeks. Table 4 also showed the length of time each subject received physical therapy treatment. The average time was 7.8 weeks for patients with single subluxation and 34.5 weeks for patients with multiple subluxations. The MCKOM scores are shown in Table 5 including a mean score of 90.75% with scores ranging from 74% to 100% for the 8 participants. A rating of above 80% on the MCKOM is indicative of an excellent score. Six of the 8 participants scored higher than 80%.

Participants' scores on the MCKOM reflect the outcome of post rehabilitation return to function. For the participants, it was important to return to the sport that each had participated in prior to injury, without instability or reoccurrence of subluxation. When assessing the effectiveness of the rehabilitation guideline, sections 3, 4, 7, and 8 of the MCKOM were analyzed individually for every participant as those sections exhibit function of each participant at follow-up. The comparison between the point at which the participants reached Stage III (running, Table 6) and his or her function at follow-up demonstrates the success of the guideline in returning the participants to prior activity or level of function.

Section 3 on the MCKOM pertained to the participants affected knee "giving way" or residual weakness post rehabilitation. Section 3 has 6 options that have the following values per answer in order: 20, 16, 14, 12, 8, 4, and 0. The participants' mean score for Section 3 was 18, with a range of 12 to 20. Five out of 8 participants scored the highest possible, 20, indicating that 62.5% of participants resulted in "no giving way" post rehabilita-

Table 2. Time Line for Range of Motion, Bracing, and Weight-bearing Status

Conservative	Progression of Flexion ROM *Weeks from initial injury date					Full Extension	Unlocked Bledsoe	FWB
	30°	60°	90°	120°	>120°			
C1				1	2	4	3	3
C2				8	14	8	9	8
C3	2	2		5	8	2	3	5
C4	4		6	9	14	13 (genu recurvatum)	3	9
C5					4	2	4	4
C6			4		7	7	No Brace	1
C7				3	3	2	3	4
C8				2	8	Not Documented	Initial J Brace (patella stabilizing brace)	2
Time Frame	2-4	2	4-6	1-9	2-16	2-13	3-9	1-9
Average Time	3	2	5	4.5	5.3	5.4	4.2	4.8

Abbreviation: ROM, range of motion; FWB, full weight bearing

Table 3. Length of Time for Transition from Table Exercises to Advanced Strengthening Exercises

Conservative	Nonweight-bearing Exercises	Adductor Strengthening	Advanced Strengthening Exercises
C1	1	2	6
C2	8	8	8
C3	2	3	3
C4	4	8	9
C5	4	5	5
C6	4	4	4
C7	4	4	4
C8	2	2	5
Time Frame (wks)	2-8	2-8	4-9
Average (wks)	3.6	4.5	5.5

Table 3 Key. Transition of Exercises

NWB Exercises	Quad sets, SLR program, multiangle isometrics, modified range active knee extension (Figure 1)
Adductor Strengthening	Ball squeeze, SLR adduction, bridging with ball squeeze
Advanced Strengthening Exercises	Leg press, bilateral leg press, unilateral leg press, leg press with ball squeeze, single leg squats, squats with ball squeeze, lunges, step ups, shuttle (bilateral, unilateral, ball squeeze), progression to standing exercises, single leg strengthening progression: standing hip PREs all planes (Figure 2, 3)
Criteria for Progression	Progressing ROM, decreased edema, minimizing pain, without extensor lag, WBAT to FWB, upper extremity as needed. Improved posture with control of knee and hip, increased endurance and power.
Red Flags	Pain, altered postures to complete an exercise, edema, improper form, fatigue on one side compared to another, or substitution from other muscles.

Abbreviations: NWB, nonweight bearing; SLR, straight leg raise; PREs, progressive resistance exercises; ROM, range of motion; WBAT, weight bearing as tolerated; FWB, full weight bearing

tion. Only Subject C2 answered a score less than 16 (Table 5).

Section 4 considered overall activity level, which is important to compare to the time at which the participants returned to sport (stage VI) of the guideline (Table 6). For section 4, overall activity level, 50% answered in the top category indicating excellent (20 points) and the other 50% responded with the very good outcome answer (16 points). See Table 5 regarding these values. Functional activities post rehabilitation including section 7 (running activity) and section 8 (jumping or twisting) were also considered for each participant individually.

Section 7 concerning the running activities, it is important to note the participants return to running (stage III) when comparing function at follow-up (Table 6). Participant C7's running timeline was not documented during the course of physical therapy treatment; however, it was noted on the MCKOM at follow-up that the subject was running at 78 weeks. For section 7, running activity, 75% of subjects answered in the top category indicating an excellent outcome (5 points) and the other 25% responded with every good outcome (4 points). See Table 5 regarding these values.

Section 8 assessed the jumping or twisting which is important to consider when comparing the time at which each participant reached Stage IV (Table 6). Subject C3 was not documented for Stage IV; however, at week 62 follow-up, it was noted that subject answered a score of 4 (very good) on the MCKOMS. For section 8, jumping or twisting, 50% answered in the top category indicating an excellent outcome (5 points) and

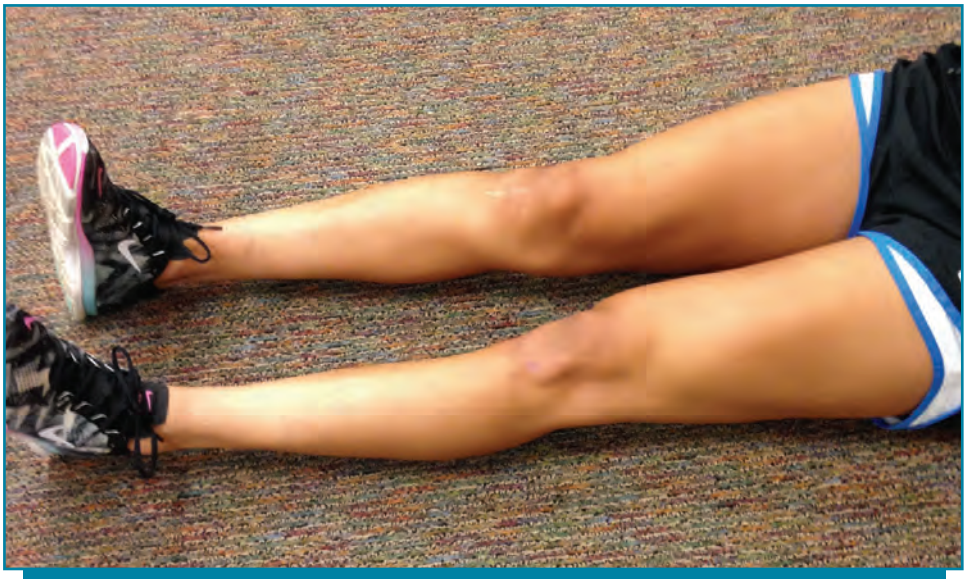

Figure 1. Quad set.

Figure 2. Wall squat with adductor squeeze.

Figure 3. Standing hip adduction with Thera-Band.

the other 50% answered with a very good outcome (4 points). See Table 5 regarding these values.

DISCUSSION

Within our patient population improvements toward full knee ROM, visible contraction of the quadriceps muscle, improved gliding of the patella superiorly, and the ability to perform a straight leg raise without an extensor lag were all seen in follow-up.[18,19]

It has been well documented that certain anatomical factors contribute to lateral dislocation. As described by Smith and Davies et al in 2010,[1] the patellar alignment is altered from the trochlear groove due to poor bony stability, or the vastus lateralis overpowering the VMO. The authors felt that the firing of the adductor muscle would aide in the recruitment of the VMO during quadricep contraction improving the patella tracking mechanism during treatment progression.[20-23] The authors considered overall control of the lower extremity in positions of a closed chain exercise for static to dynamic proprioception, running, plyometrics, and sport specific drills.[23]

Other factors contributing to patellar instability include genu valgum, hyperlaxity, subtalar pronation, and hip anteversion.[24] Panni et al[24] discussed that traumatic patellar dislocation occurs frequently in sporting and physical activity, whereas females have higher incidences of patellar subluxations. Sports requiring a quick change in direction, cutting maneuvers, and a direct mechanism or traumatic blow to the medial aspect of the patella could be another contributing factor.[25] The literature suggests that females under the age of 18 have the higher incidence of lateral patellar subluxation/dislocation.[24]

The majority of the literature suggested a period of immobilization after lateral dislocation. Immobilization is necessary to decrease the edema, allowing the patella to re-engage in the trochlear groove, as well as increasing ROM of the knee to promote functional activity including adequate knee flexion/extension for normal gait.[1,2,11,24,25]

The quadricep set is an important exercise as it provides a superior glide of the patella to promote engagement in the trochlear groove and control the knee during gait to prevent buckling.[18] A separate category of adductor strengthening exercises, which included ball squeezes between the knees and straight leg raise (SLR) in adduction, aids in the recruitment of the VMO. Hanten and Schulthies[20] discussed that chronic lateral patellar dislocation produces a disruption of the oblique fibers of the VMO off the adductor magnus. They demonstrated that hip adduction exercises increased the electrical activity of the VMO when compared to the vastus lateralis. Bicos et al[6] also suggested that the anterior extent of the MPFL is connected to the VMO, therefore, aiding in the dynamic control of the patella medially and allowing for smooth passage of the patella into the trochlear sulcus of the femur. Smith and Davies et al[1] discussed specific VMO strengthening was not used in 2 of the 29 studies of their systematic review of clinical outcomes of rehabilitation following lateral patellar dislocation which impacted the outcomes in those two studies. Therefore, we felt the importance of performing adduction exercises to help recruit the VMO for improved dynamic medial stability of the patella.[1]

Proprioceptive exercises for the lower extremity are crucial for the patient to be able to return to functional activity.[12] In 2005, Mountney et al[12] discussed that the MPFL is innervated and that its role in proprioceptive-

Table 4. Stage Timeline for Return to Sport/Functional Activity

Subjects	Stage I	Stage II	Stage III	Stage IV	Stage V	Stage VI	Total Weeks of Physical Therapy Treatment
C1	2	3	7	8	8	9 Soccer	6
C2	9	12	14	15		17 Fitness	8
C3	5	Discontinued Treatment after 8 weeks				Fitness	6
C4	7	8	15	19	19	20 Dance	43
C5	6	8	9	9	11	13 Track	15
C6	5	7	6	11	13	25 Track (Hurdler)	26
C7	4	6	-	7	-	6 Soccer	3
C8	5	8	6	9	10	17 Basketball	9
Time Frame (wks)	2-9	3-12	6-15	7-19	10-19	6-25	3-43
Average (wks)	5.37	7.4	9.5	11.14	12.2	15.28	Single: 7.8 Multiple: 34.5

Table 4 Key. Timeline for Progression of Exercises in Rehabilitation Stages

Stage I Static Proprioception	Static wobble board, dyna disc, cone touch, bilateral to unilateral weight bearing (Figure 4)
Stage II Dynamic Proprioception	Agility drills (shuffle, two step with circles), single leg squat, single hopping in place, BOSU squats (Figure 5A, 5B)
Stage III Running	Progress speed as tolerated, cone drills
Stage IV Plyometrics	Jumping boxes, jump and squat, hop and squat, lateral jump, unilateral leg box jump, (Figure 6, 7)
Stage V Sport Specific Drills	Cutting, pivoting, activity based on sport, hurdles, ring jump and land (Figure 8, 9)
Stage VI Return to Sport	When subjects returned to sport (weeks)

tion is of importance. Menetrey et al[11] further emphasized the importance of dynamic stability.

For subjects in our study, the advanced strengthening programs were initiated after the patients had demonstrated proper quadriceps control and improved superior gliding of the patella. The subjects had sufficient ROM at the knee, improved control of the lower extremity, and had progressed to FWB without buckling of the knee and displayed a normal gait pattern. They performed exercises such as the leg press with a ball squeeze and standing hip flexion, abduction, extension, and adduction with a Thera-Band with the knee held in extension. They were progressed to reverse terminal knee extension, lunges, step ups, squats, and shuttle with ball squeeze in a closed chain position.[23] These exercises were initiated between 4 and 9 weeks postinjury.

Irish and Millward et al[22] discussed the importance of the double leg squat with adduction and lunging to foster improved patellar tracking due to a greater VMO to vastus lateralis ratio. Other authors have shown that the VMO activity is best at 60° of knee flexion in a closed chain position.[24,26]

The subjects began stage I, starting 2 to 9 weeks following date of injury. Stage II began dynamic proprioceptive exercises from weeks 3 through 12, which included agility drills to single squat and hopping. At 6 to 15 weeks, stage III running was incorporated which began as a one minute jog, one minute walk, repeating the cycle 3 to 4 times on a Woodway treadmill with upper extremity support as needed. The progression of running, in minutes and speed, continued throughout their program. Plyometrics incorporated hop and squat, jump and squat, and box jumps, which occurred between 7 and 19 weeks. For the forces to be absorbed correctly from jumping, it was noted that the therapists had engaged in constant cueing on appropriate landing with hip and knee flexion as well as contact with the mid foot. In addition, hip control

Figure 4. Correct single leg wobble board.

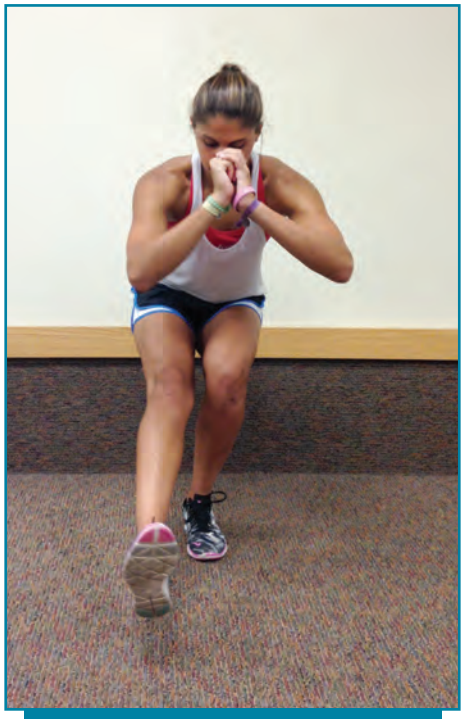

Figure 5A. Correct single leg squat.

Figure 5B. Incorrect single leg squat.

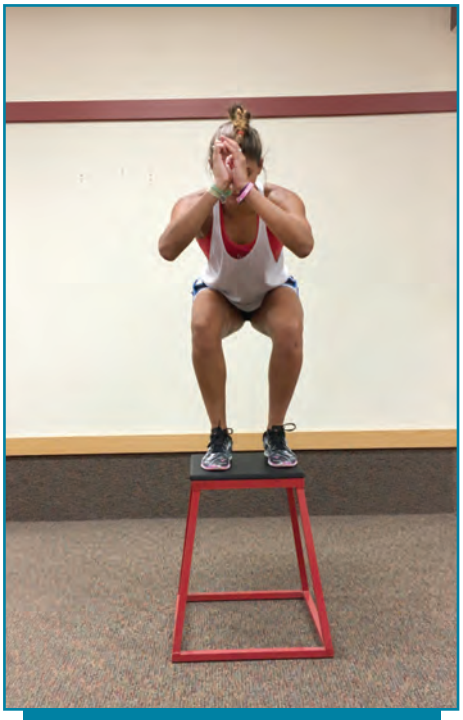

Figure 6. Box jumps.

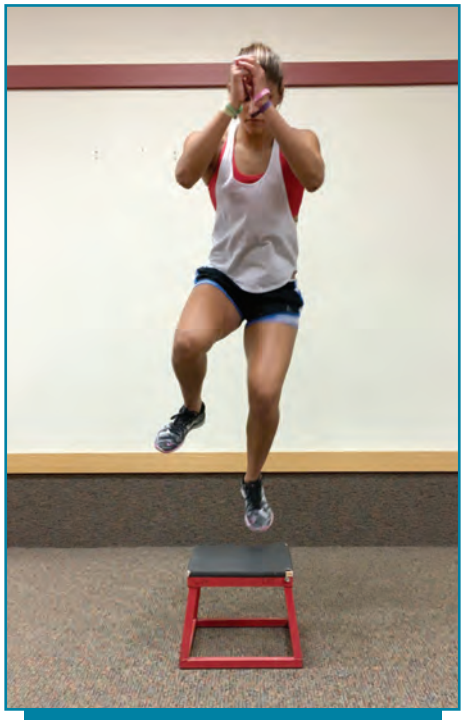

Figure 7. Single leg box jumps.

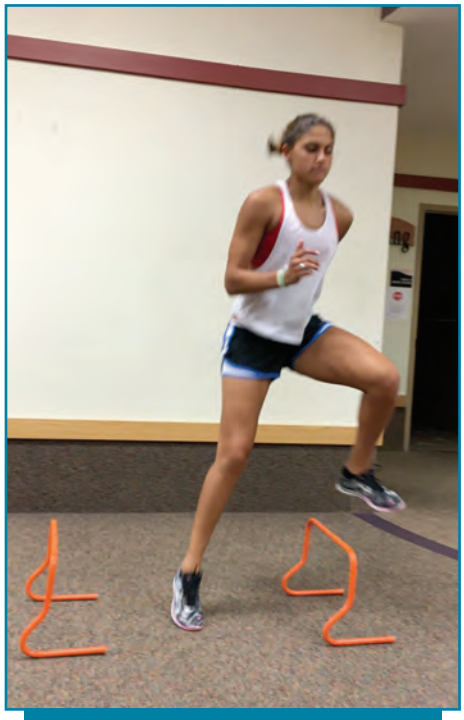

Figure 8. Hurdles high knees.

was stressed to prevent a hip drop and valgus at the knee, which contributes to a lateral patella force. Sport specific drills between 10 and 19 weeks included cutting, pivoting, and sport-based activity. Full return to sport for 7 of the 8 subjects occurred between 6 and 25 weeks.

The course of therapy for return to sport/functional activity lasted from week 6 to week 25 for return to sport. Each physical therapy exercise treatment program was adjusted on a case by case basis for the subjects depending upon their sport or functional activity requirements. They all were instructed in a home exercise program throughout the course of treatment and at discharge.

The ultimate goal of this case series was to discuss the physical therapy findings that can lead to safe return to sport/functional activity. The author's previous work discussed rehabilitation program for medial patello-femoral ligament reconstruction including a treatment progression timeline and the use of the MCKOM.[19] Through this questionnaire

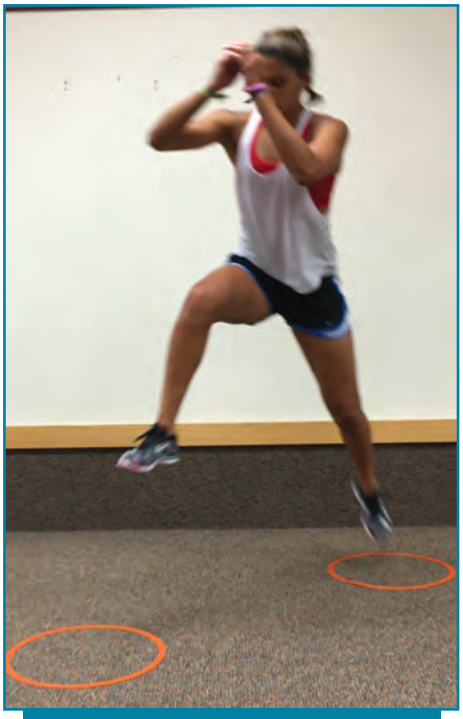

Figure 9. Ring jump and land.

the subjects overall confidence in functional movement is depicted.[14-16,19] The MCKOM demonstrated 6 subjects obtaining an "excellent" score and two subjects obtaining a "good" score on follow-ups, which were from 62 weeks to 164 weeks from date of initial injury. As per the MCKOM, the patients demonstrated excellent scores of 90.75%. Regarding successful return to sport or activity of these subjects, two returned to soccer, one to dance, two to fitness, one to track, one to track and hurdling, and one to basketball.

OUTCOMES

Patients with single subluxation responded well to physical therapy and were able to return to sport or functional activity. For one subject, who had sustained multiple patella subluxations, the overall outcome scores were lower after 26 weeks even though this subject returned to full functional activity. Another subject demonstrated an excellent score on follow-up after a total course of physical therapy treatment that had lasted 43 weeks. The average length of physical therapy treatment for patients with single subluxations/dislocations was 7.8 weeks and for multiple subluxations/dislocations was 34.5 weeks (see Table 4). The MCKOM Section 3 that reports the instability of "giving way," 62.5% of the subjects reported "no giving way." Our other purpose was to develop a timeline, in weeks, for physical therapy treatment (Table 7). The photographs of the different stages in rehabilitation aid in understanding of when to properly progress the patient to advanced stages of exercise, proprioception, and return to sport or functional activity.

Limitation

There are several limitations to this retrospective case series. The sample size is small with only 8 subjects with ages ranging from 10 to 34 that may limit the reliability to others outside of the range. The subjects were patients that attended one clinic thus decreasing random selection. One subject's extension ROM was not documented, another subject was documented with genu recurvatum. One subject moved after 5 weeks of care and another subject did not have a complete documentation of their stages of running. The collection of data was done after the completion of physical therapy through a wide range of time following discharge (62 to 164 weeks). Also with this retrospective analysis we do not know the efficacy or appropriateness of our progression since we had no comparative data in reference to other criteria based programs. We also recommend that randomized control studies for physical therapy intervention for lateral patella subluxation be conducted to compare outcomes following surgical and nonsurgical cases.

CONCLUSION

Our results suggested that all patients with single or multiple subluxations of the patella were able to return to sport or functional activity after physical therapy intervention and instruction on a home exercise

Table 5. Modified Cincinnati Knee Outcome Measure Scores Breakdown: 3 Giving Way, 4 Overall Activity Level, 7 Running, & 8 Jumping

*Follow-up is from date of injury							
Modified Cincinnati Knee Outcome Measure Scores							
		Score Totals				Follow-up Date	Total Score
Sport	Subject	3	4	7	8		
Soccer	C1	20	20	5	5	155	100
Return to Fitness	C2	12	16	4	4	164	74
Return to Fitness	C3	16	16	4	4	62	84
Dance	C4	20	16	5	4	104	91
Track	C5	20	20	5	5	71	100
Track (Hurdler)	C6	16	16	5	4	104	79
Soccer	C7	20	20	5	5	78	100
Basketball	C8	20	20	5	5	157	98
Mean		18	18	4.75	4.5		90.75%
*Sections 3&4 highest score possible is 20 *Sections 7&8 highest score possible is 5 *Total score possible is 100		Section 3- Giving Way Section 4- Return to Overall Activity Section 7- Running Section 8- Jumping and Twisting				Modified Cincinatti Knee Outcome Measure Score	
						< 30 Poor	
						30-54 Fair	
						55-79 Good	
						>80 Excellent	

Table 6. Timeline Return Modified Cincinnati Knee Outcome Measure

Subject Number	Weeks to Stage III	Weeks to Stage IV	Weeks to Stage VI	Follow-up (weeks)
C1	7	8	9	155
C2	14	15	17	164
C3	Not Documented	Not Documented	Not Documented	62
C4	15	19	20	104
C5	9	9	13	71
C6	6	11	25	104
C7	Not Documented	7	6	78
C8	6	9	17	157

Stage Correlation in Table 4 to MCKOM Section Table 5
Stage III from Table 4->Section 7: Category on Running
Stage IV from Table 4->Section 8: Category on Jumping and Twisting
Stage VI from Table 4->Section 4: Category on Return to Sport

Abbreviation; MCKOM, modified Cincinnati Knee Outcome Measure

Table 7. Guideline for Physical Therapy Treatment Progression: Nonsurgical Lateral Patellar Subluxation

Weeks 1-3	Increase ROM to tolerance, nonweight-bearing exercises, adductor strengthening, and progress to WBAT with and without assistive device. Stage I: Static Proprioception--static wobble board, dyna disc, cone touch (2-9 weeks)
Weeks 3-6	Progress the ROM from 0° to greater than 120°. The above and progress to: unlocked brace, full weight bearing, advanced strengthening. Stage II: Dynamic Proprioception--agility drills, single squat, hopping, walking lunges forward and backward (3-12 weeks)
Weeks 6-9	Stage III: Running, plyometrics
Weeks 7-19	Stage IV: Plyometrics, box jumps, jump and squat, hop and squat, diagonal hop, over hurdles sport Stage V: Sport specific drills, cutting, pivoting, and activity based on sport (10-19 weeks)
Weeks 19-25	Stage VI: Continue progression of plyometrics, sports specific drills, and return to sport/functional activity

Abbreviations: ROM, range of motion; WBAT, weight bearing as tolerated

program. The MCKOM results averaged 90.75% for this population of patients, all returning to safe activity with a score of near excellent or "excellent." We feel this information will be helpful to clinicians in designing a targeted physical therapy progression for their patients diagnosed with lateral patellar subluxation. Based on our literature research, these timelines showed the average length of time in physical therapy it took patients involved in this treatment program to reach each stage of progression (see Table 7). Each program was tailored for the demands of the sport/activity each subject wished to return to, as well as to see our predicted outcomes demonstrated.

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Treatment of Shoulder Impingement Syndrome Using Non-thrust Mobilizations to the Thoracic Spine and Ribs: A Case Report

J. Quinlon Curtis, PT, DPT, OCS[1]
Jyotsna Gupta, PT, PhD[2]
Carla H. Hill, PT, DPT, OCS, Cert MDT[2]
Michael T. Gross, PT, PhD, FAPTA[2]

[1]UNC Therapy Services, University of North Carolina at Chapel Hill. Dr. Curtis completed this work as partial fulfillment for requirements in the Orthopaedic Residency Program administered by the Division of Physical Therapy at the University of North Carolina at Chapel Hill and University of North Carolina Hospitals, Chapel Hill, NC.
[2]Division of Physical Therapy, University of North Carolina at Chapel Hill, Chapel Hill, NC

ABSTRACT

Background and Purpose: Shoulder impingement syndrome (SIS) is a common diagnosis with fair outcomes. The purpose of this case report is to discuss the clinical reasoning related to a regional interdependence approach using thoracic spine and rib mobilizations for an individual with SIS. **Methods:** The patient was a 47-year-old male who experienced 4 months of left shoulder pain with overhead tasks, bench and military press exercises, and when pushing open a heavy door. Evaluation findings were consistent with SIS as well as thoracic spine and rib hypomobility. **Findings:** Following 6 physical therapy appointments with manual interventions and progressive exercises, the patient had reduced pain with all overhead tasks, exercises, and improved posture and scapular positioning. **Clinical Relevance:** This case report demonstrates the effectiveness of thoracic spine and rib mobilizations in the treatment of an individual with SIS. **Conclusion:** Thoracic spine and rib mobilizations may improve shoulder function and pain for individuals with SIS.

Key Words: posture, regional interdependence, shoulder pain, thoracic kyphosis

BACKGROUND

The reported point prevalence of shoulder pain is 7% to 26% in the general population with a lifetime prevalence of up to 67%.[1,2] The prognosis for individuals with shoulder pain is fair with recovery rates ranging from 49% to 59%.[2] The total cost for treatment of shoulder pain in the United States in 2000 was over $7 billion.[3] The most frequent causes of shoulder pain are shoulder impingement syndrome (SIS) and rotator cuff tendinitis.[4,5] Up to 48% of primary care consultations for shoulder pain are for SIS.[6] Shoulder impingement is described as the compression of the soft tissues within the subacromial space by the coracoacromial arch.[4,7] Boyles et al[8] suggest that weakness, decreased rotator cuff muscle strength, acromion anatomic variation, bone spurs, and trauma are common etiologic factors for SIS. In addition to those factors, Muth et al[9] suggest that shoulder impingement may also be caused by altered scapular kinematics, glenohumeral (GH) posterior shoulder tightness, shoulder instability, and poor posture. DePalma et al[10] discuss scapular mechanics and positioning and its relation to SIS. Numerous factors such as poor posture resulting in increased thoracic kyphosis and posterior GH tightness leading to protracted scapula can lead to decreased subacromial space, thus increasing the likelihood of SIS.

DePalma and Johnson[10] assert that altered force coupling of the serratus anterior and trapezius muscles may also result in the inferomedial angle of the scapula tilting away from the thoracic cage causing an anterior tilt of the scapula. Stronger activation of the trapezius muscles compensating for the serratus anterior can achieve GH elevation and upward scapular rotation but not a posterior scapular tilt. Kebaetse et al[11] also agree that individuals with greater thoracic kyphosis have reduced posterior tilting of the scapula during GH elevation. This may result in the acromion causing a bony block to the humeral head during elevation and may contribute to shoulder impingement.

Abdulla et al[6] completed a recent systematic review that compared the effectiveness of exercise therapy to other interventions, placebos, and no interventions for improving function, pain, and quality of life for individuals with soft tissue injuries of the shoulder. The authors concluded that supervised strengthening and stretching of the rotator cuff and scapular muscles was as effective as corticosteroid injections or multimodal care for short-term outcomes for SIS. They also concluded that supervised and home-based progressive strengthening exercise led to similar long-term outcomes compared with shoulder decompression surgery for persistent SIS.

Conventional treatment for SIS has primarily focused on the GH and scapulothoracic joints without taking into account the influence of thoracic spine and rib mechanics.[2] Wainner et al[12] described regional interdependence as occurring when "seemingly unrelated impairments in a remote anatomical region may contribute to, or be associated with, the patient's primary complaint." Regional interdependence posits that deficits in one area can result in impairments and dysfunctions in another area. For example, thoracic and rib mobility deficits may contribute to shoulder pain and impairment. Not addressing the remote deficit may lead to the continuation of pain and associated impairments.[13] For full bilateral humeral elevation, 15° of thoracic extension is required.[13,14] Otoshi et al[14] suggest that reduced thoracic segmental mobility and increased thoracic kyphosis may contribute to the development of SIS due to its effect on the scapula.

Several authors support the concept of improving outcomes for shoulder pain by treating the thoracic spine and ribs.[4,6,8,15-17] Norlander et al[18] assessed 139 laundry workers and determined that thoracic spine hypomobility increased the likelihood of developing shoulder and neck pain by 3-fold. Additionally, Sobel et al[19] determined that 40% of 101 individuals with nonspecific shoulder pain had pain and dysfunction of the second rib and cervicothoracic junction. Peek et al[13] discussed that cervical manipulations have demonstrated improvements in pain and impairments in individuals with nonspecific shoulder pain but involve inherent risks. Risks and adverse events associated with cervical manipulations may range from minor to more severe.[20] These adverse events may include headaches, dizziness, increase in neck pain, ringing in the ears, impaired vision, or neurovascular compromise. Cervical artery dysfunction relating to vertebral

basilar or internal carotid artery insufficiency that may result in stroke or death is the most adverse event related to cervical spine manipulation. They suggest that manual therapy to the thoracic spine may lead to similar neurophysiological effects while avoiding risks and adverse events associated with cervical manipulations.[13] The benefits of thoracic spine manipulation in the treatment of individuals with SIS is well documented,[4,8,13,16,17] but to our knowledge no research efforts have investigated whether thoracic spine mobilization could be an equally effective intervention. The purpose of this case report is to discuss the management of a patient with SIS using thoracic spine and rib mobilizations in conjunction with a strengthening and stretching home exercise program (HEP).

CASE DESCRIPTION

Patient History

The patient was a 47-year-old left hand dominant male who self-referred to physical therapy for left shoulder pain that began 4 months prior to the initial evaluation. The patient reported that he exercised several days a week, which included upper body activities such as bench press, military press, and push-ups. His job as a professor required him to sit for prolonged periods of time. He reported that his symptoms began as a "twinge" and progressed to a deep, sharp pain in the anterior left shoulder after he did push-ups on an unstable surface, producing immediate onset of pain equal to 7-8/10 on the 11-point Numerical Pain Rating Scale (NPRS). Pain recurred with overhead tasks, bench and military press exercises, and when pushing open a heavy door but would return to 0/10 immediately when he stopped the provocative tasks. He also reported a clicking sensation around the superior angle of the scapula during GH abduction and elevation in the scapular plane. He denied having any neck or upper extremity pain or other neurological symptoms.

Following the initial injury, the patient went to his primary physician who administered an injection of cortisone into the left subacromial space and provided a HEP after the plain radiographs showed no bone or joint abnormalities. The HEP included shoulder internal rotation and external rotation strengthening exercises and pectoralis muscle stretching. The patient reported no relief following those initial interventions. No further diagnostic testing had been completed nor did he have any prior physical therapy treatment since the onset of these symptoms. The patient had a left rotator cuff repair 26 years ago for a baseball injury he sustained in college.

No red flags, such as nausea, vomiting, unexplained weight loss or gain, altered respiration, or history of cancer, were identified during the subjective portion of the evaluation. The patient's goal was to return to his prior exercise program without pain. The subjective examination suggested the clinical diagnoses of: acromioclavicular (AC) joint pathology, rotator cuff pathology, shoulder labral pathology, and SIS. These potential diagnoses determined the selection of objective examination procedures.

Self-report Outcome Measures

The QuickDASH and NPRS were the primary self-report outcome measures used in this case report. The QuickDASH is an 11-question outcome assessment tool that has good reliability (ICC = .90). The tool also has sports/performing arts and work modules that are optional, with 4 questions in each module. The scores range from 0% to 100% with 100% indicating the most disability. Mintken et al[21] determined the minimal clinically important difference (MCID) for this instrument is 8 percentage points. The patient scored an 11.4% on the QuickDASH and a 31.3% on the sports/performing arts module. The NPRS ranges from 0 to 10 to identify the patient's level of pain with 0 indicating "no pain" and 10 indicating "worst imaginable pain." For individuals with shoulder pain the MCID for the NPRS is 1.1 points.

Physical Examination

The patient's sitting and standing posture revealed a forward head position, protracted scapulae, and an increased middle and upper thoracic kyphosis. In standing, the left scapula was in an anteriorly tilted position. A neurological screen revealed normal sensation to light touch throughout bilateral upper quarter dermatomes. A detailed cervical examination was negative.

The AC joint was point tender to palpation with no tenderness along the lesser or greater tubercles of the humerus, the long head of biceps tendon, supraspinatus tendon, or deltoid tuberosity. Passive accessory intervertebral movement (PAIVM) testing of the thoracic spine revealed hypomobility of the first through eighth thoracic spinal segments with central and bilateral unilateral posterior-to-anterior (PA) movement testing. Ribs 4 - 7 on the left were also hypomobile with unilateral rib angle PA movement testing.

Shoulder active range of motion (ROM) using a goniometer revealed reduced shoulder flexion (150° bilaterally) and abduction (148° right and 145° left with end range pain). Functional shoulder internal rotation and external rotation were assessed by the ability to complete hand-behind-back (HBB) and hand-behind-head (HBH), respectively. For HBB motion, the patient's right hand reached the T7 spinous process and his left hand reached the T9 spinous process. For HBH motion, his right hand reached the T3 spinous process and his left hand reached the T1 spinous process. The patient reported no pain during these movements. Manual muscle testing (MMT) of his right shoulder and bilateral elbows indicated normal strength (5/5). Left shoulder flexion, abduction, and external and internal rotations at 0° abduction were all weak (4/5) and painful.

An AC joint pathology was included as a differential diagnosis due to the patient having pain at end range abduction, pain with pushing open a heavy door, and pain with palpation over the AC joint. Chronopoulos et al[25] established a cluster of 3 physical examination tests to confirm the diagnosis of AC joint lesions which included (1) cross body adduction stress test, (2) AC resisted extension test, and (3) active compression test. If two or more of these tests are positive, then the likelihood of shoulder pain due to an AC joint lesion increases with a sensitivity of 81% and specificity of 89%. During the evaluation, the cross body adduction stress test was the only positive test (Table 1). Since only 1 of the 3 AC joint provocation tests were positive, AC joint pathology was ruled out.

Shoulder pain due to a rotator cuff tear was included as a differential diagnosis due to the patient's prior history of a rotator cuff repair, shoulder muscle weakness, and pain during exercise. Bak et al[26] suggested a cluster of 3 physical examination tests to determine the presence of a rotator cuff tear. These tests included (1) active abduction less than 90°, (2) empty can, and (3) external rotation lag sign. The authors determined the cluster has a sensitivity of .54, specificity of .65, positive likelihood ratio of 1.2, and negative likelihood ratio of .71. They cautioned that this test cluster should be used with other evaluation techniques and findings to identify the presence of rotator cuff tears. Of the tests in the cluster, only the Empty Can Test was positive. Other physical examination tests that were completed for assessing a possible rotator cuff tear included the Drop Arm Test and Hornblower's Sign. Bak et al[26] determined that the Drop Arm Test had a sensitivity of .17 and a specificity of .96. Walch et al[27] reported that the Hornblower's Sign

Table 1. Shoulder Special Tests and Results

Condition	Special Test	Result
Shoulder Impingement Syndrome		
	Hawkins-Kennedy	Positive
	Neer	Positive
	Painful Arc	Negative
	Empty Can	Positive
	External Rotation Weakness	Positive
Rotator Cuff Pathology		
	Active Abduction < 90°	Negative
	Empty Can	Positive
	External Rotation Lag Sign	Negative
	Drop Arm Test	Negative
	Hornblower's Sign	Negative
Labral Pathology		
	Active Compression Test	Negative
	Compression-Rotation Test	Negative
	Biceps Load II Test	Negative
AC Joint Pathology		
	Cross Body Adduction Stress Test	Positive
	AC Resisted Extension	Negative
	Active Compression	Negative
Abbreviation: AC, acromioclavicular		

has a sensitivity of 100% and a specificity of 93%. These tests were both negative (Table 1). Since only one of the 5 tests were positive, shoulder pain due to a rotator cuff tear was also ruled out.

A glenoid labral tear was included as a differential diagnosis secondary to the patient reporting a pain deep in his shoulder and a report of clicking in the shoulder region. Oh et al[28] established a cluster of physical examination tests for assessing a glenoid labral tear. The authors determined that the combination of the Active Compression Test, Compression-Rotation Test, and Biceps Load II Test has a specificity of approximately 95% if all 3 tests are found to be positive. The Active Compression Test, Compression-Rotation Test, and Biceps Load II Test were all negative, which greatly reduced the likelihood of a glenoid labral tear as the cause of this patient's shoulder pain (Table 1).

Finally, SIS was included as a differential diagnosis based on the research report by Michener et al,[7] who established a cluster of 5 shoulder physical examination tests to confirm the diagnosis of SIS when 3 or more are positive. The cluster has a sensitivity of 75%, specificity of 74%, positive likelihood ratio of 2.93, and negative likelihood ratio of 0.34. The 5 tests include (1) Hawkins-Kennedy, (2) Neer, (3) Painful Arc, (4) Empty Can, and (5) External Rotation (ER) Resistance Test. Using this test cluster the Hawkins-Kennedy, Neer, Empty Can, and ER Resistance Tests were positive, thus confirming the diagnosis of SIS (Table 1).

CLINICAL IMPRESSION

Based on the subjective history, objective measures, and physical examination tests, a working diagnosis of SIS was determined. Consistent with SIS, the patient reported having a clicking sensation around the scapular region, the inability to exercise due to pain, and generalized shoulder weakness. His posture revealed an increased upper and middle thoracic spine kyphosis and a left anteriorly titled scapula. The patient demonstrated pain and weakness during shoulder MMT including external rotation. The patient had a positive finding for 4 of the 5 tests in the SIS cluster. He also had hypomobility of numerous thoracic spine segments and ribs with PA movement testing. Kebaetse et al[11] discusses the effects of thoracic position on shoulder ROM, strength, and scapular kinematics. A slouched posture results in reduced shoulder abduction ROM, decreased scapular posterior tilting, and decreased muscle force.

INTERVENTIONS

After completion of the physical examination, conservative physical therapy management was deemed appropriate. Treatment consisted of manual physical therapy intervention with a HEP consisting of strengthening and stretching exercises that were progressed at each subsequent visit. Manual physical therapy intervention included non-thrust mobilizations (Grade III and Grade IV) as follows: supine C7-T8 (Figures 1-3), prone T1-8 (Figure 4), and prone PA mobilizations to the left ribs 4 – 7 (Figure 5).

The HEP included thoracic extension over a towel roll, resisted scapular retraction, resisted serratus punch at 120° flexion, push-ups, scapular protraction on elbows, resisted shoulder internal and external rotation at 0° abduction, and cross-body posterior shoulder stretches. Shoulder pain during ROM testing, and during push-ups were assessed before and after the manual intervention (Tables 2 and 3).

OUTCOMES

The patient attended 6 physical therapy visits over the span of 6 weeks. He had improvements on the NPRS and QuickDASH self-report outcome measures at discharge. He reported a NPRS of 0-1/10 during all overhead and pushing activities at his last visit. During the last treatment session, the patient completed the following tasks: 15 repetitions of floor push-ups, 10 repetitions of bench press with 15-lb dumbbells in each hand, 10 repetitions with 20-lb dumbbells, and 10 repetitions with 25-lb dumbbells. All of these exercises were completed without any pain. The patient reported that he was able to perform 10 repetitions of military press with 10-lb dumbbells in each hand during his home gym workout just prior to his last visit. Also, he no longer experienced pain while opening a heavy door nor clicking sensation around the scapula during GH abduction or elevation in the scapular plane.

Improvement in the painfree shoulder ROM were as follows: flexion and abduction 170° bilaterally, HBB with his left hand to T7 spinous process, and HBH with his left hand to the T3 spinous process. The QuickDASH and QuickDASH sport/performing art module scores improved from 11.4% to 0% and 31.3% to 0%, respectively. The patient also demonstrated an improved upright posture in standing with normal thoracic spine kyphosis, and the left scapular anterior tilt was resolved. He understood how to progressively return to his normal workout routine. A 2-week follow-up was conducted by telephone and the patient reported that his left shoulder was painfree and he had returned to his regular exercise routine without issue.

DISCUSSION

This case describes the examination and intervention approach for an individual with SIS. Several investigators have explored the concept of regional interdependence

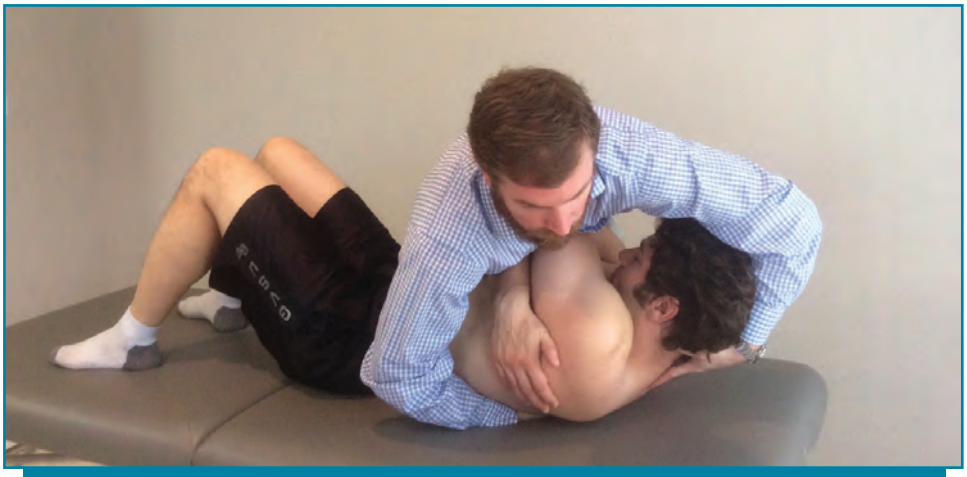

Figure 1. Supine middle thoracic spine mobilization technique.

Figure 2. Supine upper thoracic spine mobilization technique.

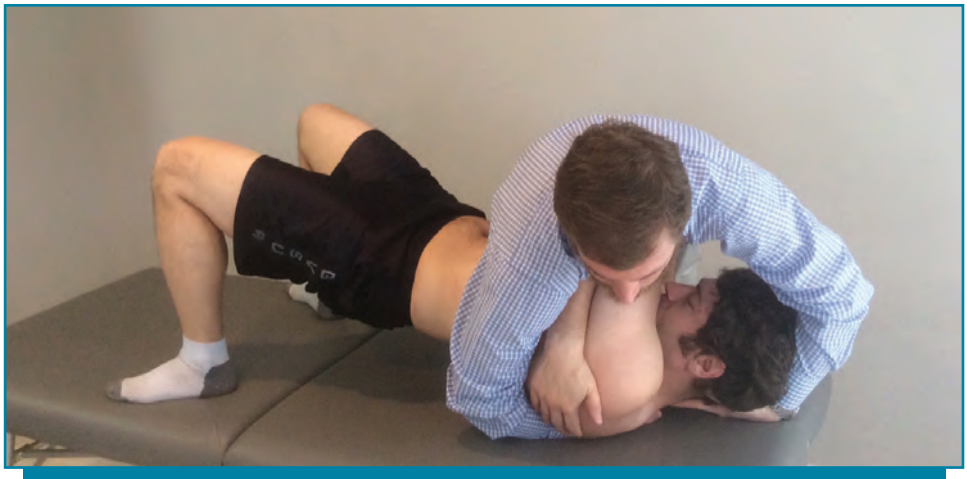

Figure 3. Supine cervicothoracic junction spine mobilization technique.

for improving shoulder pain and function through treatment of thoracic spine and rib mobility deficits with significant positive outcomes.[4,8,15-17] Dysfunctions of the thoracic spine and ribs may be correlated with the occurrence and poor outcomes of shoulder impairments and has been found to triple the risk for shoulder complications.[15] Increased thoracic kyphosis leads to a relatively protracted scapula and reduced posterior scapular tilting, thereby compromising the subacromial space.[10,11] Based on its relationship to the shoulder, assessment and treatment of thoracic spine and rib dysfunction is recommended for improving outcomes and function for individuals with shoulder pain attributed to SIS.[4-8,15-17] The interventions selected in this case were chosen based on the concept of regional interdependence.[12] Bang and Deyle[4] determined that individuals who had SIS demonstrated improved pain, strength, and function following a course of manual therapy in conjunction with strength and stretching exercises as compared with strength and stretching exercises alone. Boyles et al[8] found that patients with SIS had a significant reduction in pain and disability 2 days following a single session of thoracic spine thrust manipulation.

This case report also demonstrates the possible effectiveness of thoracic spine and rib non-thrust mobilization for an individual with SIS. Several researchers have demonstrated that thrust mobilizations are effective for treating individuals with shoulder dysfunction and pain but few studies have investigated the effectiveness of non-thrust mobilizations and none have directly compared these two interventions to our knowledge.[4,8,13,16,17] The effect of thoracic spine mobilizations compared with thoracic spine manipulation on neck pain has been investigated.[26,27] Cleland et al[29] determined that individuals with neck pain had a greater reduction in pain and disability following manipulation compared with those who received mobilization. Suvarnnato et al[30] compared manipulation to mobilization for treating chronic neck pain. The authors determined that both manipulation and mobilization were effective in reducing pain and improving cervical ROM.

As there are no studies that compare thoracic spine mobilization to manipulation for individuals with SIS, the primary author of this case report hypothesized that non-thrust thoracic spine and rib mobilizations may yield similar results as thoracic spine thrust manipulation for reducing shoulder pain and improving function. Strunce et al[17] discusses

Figure 4. Prone middle and upper thoracic spine mobilization technique.

Figure 5. Prone left posterior-anterior rib mobilization technique.

several mechanisms that may contribute to improved shoulder function and pain following manual therapy interventions. Biomechanical contributions from improving thoracic spine and rib mobility may improve shoulder ROM by restoring the 15° of thoracic extension required for GH elevation.[13,17]

Another proposed mechanism for improved shoulder function may be attributed to a neurophysiological effect.[31,32] Bialosky et al[31] discuss that following spinal manipulation there are neurophysiological changes. These changes include an increase in afferent discharge, motor neuron pool depression, motor activity changes, and reduction in pain perception in response to a standard stimulus. These mechanisms may explain why the patient had a significant improvement in shoulder function and pain following manual therapy intervention.

This case report has several inherent limitations, including no control group and no long-term follow-up. A diagnosis of SIS was based on the cumulative information of the patient's clinical presentation and findings on special tests, however, the patient also had signs and symptoms consistent with other shoulder pathologies. Another limitation of this study is the use of the QuickDASH outcome measure. Angst et al[33] suggest that the QuickDASH may underestimate symptoms and overestimate disabilities when compared with the DASH. Despite these limitations, the patient achieved a positive outcome with the treatment procedures described in this study and returned to his previous activities without shoulder pain.

CLINICAL APPLICATION

This case report highlights the clinical reasoning using a regional interdependence approach for an individual with SIS. Initial treatment consisting of a cortisone injection and a shoulder exercise program provided by the patient's physician did not improve his symptoms or function. The regional examination and mobilization of the thoracic spine and the ribs was part of a treatment approach that significantly improved shoulder pain and function. Non-thrust thoracic spine and rib mobilizations can be an effective intervention for an individual with shoulder pain, however, the magnitude of symptom response compared to treatment with spinal manipulation is unknown. A larger cohort study is needed to explore the difference in response between non-thrust mobilizations and thrust manipulations of the thoracic spine in the treatment of SIS.

Table 2. Shoulder Active Range of Motion and Pain Pre- and Post-manual Treatment*

	Shoulder Flexion/Abduction Active ROM		Pain with Shoulder Active ROM as NPRS	
Visit #	Pre-manual Tx	Post-manual Tx	Pre-manual Tx	Post-manual Tx
Initial Evaluation	150/145	160/160	7-8/10	7-8/10
2	159/155	160/160	2/10	0/10
3	160/160	165/165	1/10	0/10
4	165/165	170/170	1/10	0/10
5	165/165	170/170	1/10	0/10
Discharge	170/170	Not Tested	0/10	Not Tested

*Active ROM reported in degrees and pain values as 0-10 on the NPRS reported by patient

Abbreviations: ROM, range of motion; NRPS, National Pain Rating Scale; Tx, treatment

Table 3. Pain Intensity During Push-ups Pre- and Post-manual Treatment*

Visit #	Push-up Pre-manual Tx	Push-up Post-manual Tx
Initial Evaluation	Unable	Not Tested
2	3/10 (wall push-up)	1/10 (wall push-up)
3	2/10 (wall push-up)	1/10 (wall push-up)
4	1/10 (wall push-up)	0/10 (incline push-up)
5	1-2/10 (floor push-up x5)	0-1/10 (floor push-up x 10)
Discharge	0/10 (floor push-up x 15)	Not Tested

*Pain values as a 0-10 on the NPRS reported by patient

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Proposed Name Change

Kathy Cieslak, PT, DScPT, MEd, OCS

Orthopaedic Section Members:

The Orthopaedic Section, APTA, Inc. is seeking a name change to the Academy of Orthopaedic Physical Therapy. In accordance with Article XV, Amendments of the Bylaws of the Orthopaedic Section, APTA, Inc., the first step in the process is to bring forth the proposed amendment for discussion at the Annual Section Membership Meeting. The purpose of this communication is to introduce the proposed amendment and provide rationale for the proposed name change.

Proposed Amendment to Article I. Name and Relationship to American Physical Therapy Association:

This corporation, The Academy of Orthopaedic ~~Section~~ Physical Therapy, APTA, Inc. (the ~~Section~~ "Academy") shall be a component of the American Physical Therapy Association (the "Association").

Background: A name is a term used for identification. A name should accurately reflect and define how an organization is known. The term Section has limited meaning and refers to a part or portion of something. By using the term Section in our name, it limits the accurate representation of who we are as an organization both within the APTA and to external entities.

The APTA vision statement adopted in the 2013 APTA House of Delegates, "Transforming society by optimizing movement to improve the human experience," is reflective of a more external view of the health care environment and the relationship of the entire human experience. The Section hopes to make a more external statement as well, with our name change to the Academy of Orthopaedic Physical Therapy. The name change aligns with our mission and vision statements:

Mission: The mission of the Orthopaedic Section, APTA, Inc. (Orthopaedic Section) is to promote excellence in orthopaedic physical therapy.

Vision: The Orthopaedic Section will be a world leader in advancing orthopaedic physical therapy to optimize movement and health.

This name change clarifies the Section's identity, branding and recognition within outside stakeholder interactions and collaborations. APTA Sections are well recognized internally-not externally. The Orthopaedic Section strategic plan is directed at also promoting and expanding the Section's role as an advocate and resource for Orthopaedic Physical Therapy fostering quality patient/client care outside the physical therapy profession. The title "Academy" in this context is more easily linked with those outside the physical therapy profession and will more clearly signify to external stakeholders what we do and coincide with the practice, education, and research goals of the Section.

Description and Purpose of an Academy:

An academy is an APTA membership group focused on the science, advancement, and practice of physical therapy in a defined area of clinical practice. Academies support the vision of the profession and the mission of the association.

Primary Functions of an Academy:

- Serve as content experts for the association and advance clinical practice for a specific patient population
- Develop a base of evidence for the content area
- Establish best practices in the content area
- Propose, develop, and advance specialization/sub-specialization activities through new proposals and support ABPTS and residency and fellowship activities

Responsibilities of an Academy:

- Represent the interests of its members to the APTA Board of Directors, House of Delegates, chapters, and other governing bodies and also collaborate with APTA to external groups
- Provide education and develop educational resources for members
- Develop and propose changes to APTA policies and procedures that enhance the position of the profession

The Orthopaedic Section, founded in 1974, has a long and rich history of being visionary when determining how best to meet patient and societal needs related to orthopaedic physical therapy. The name change represents an evolution of the Orthopaedic Section with a focus on defining best practices through support of translational research, development of Clinical Practice Guidelines and the Physical Therapy Outcomes Registry, development of quality education opportunities, support of residency and fellowship programs along with many other efforts designed keep pace with the ever changing health care climate. The term "academy" is also a better descriptor for the organization's current role as an expert body for health care provider issues related to healthcare and payment reform, and as liaisons to various external groups. The time is now to make the name change to better reflect the Section's role internally and externally and better align with the mission, vision, and strategic plan of the Section.

The following Frequently Asked Questions (FAQs) were created to assist members with a better understanding of the purpose and process. Further questions should be directed to Terri DeFlorian, Executive Director of the Orthopaedic Section (tdeflorian@orthopt.org).

FAQs:

Will the Section continue to be part of the APTA? Yes, the Section will still operate as a Section of the APTA. APTA bylaws will not be changed to create any new governance for academies.

What are the advantages of pursuing a name change to "Academy of Orthopaedic Physical Therapy"?

- Better understood by external groups
- Better reflects the Section's purpose and identity
- Create distinction and focus for clinical groups
- Similar term used in other medical professions
- Promotes consistency with other APTA Sections who have made the change to Academy
- Reduce tasks beyond content expertise for academies (reduce tendency to become mini-APTAs)

Have other Sections changed their names? Yes, to date, the following Sections have changed their names to better define the Section and its purpose:

- Academy of Acute Care Physical Therapy
- Academy of Geriatric Physical Therapy
- The Academy of Hand & Upper Extremity Physical Therapy
- Academy of Neurologic Physical Therapy

(Continued on page 64)

OCCUPATIONAL HEALTH

Submitted by Dr. Trisha Perry and Lorena P. Payne

The 2018 Combined Sections Meeting (CSM) will take place in New Orleans, LA, February 21-24, 2018. The Combined Sections Meeting is a valuable forum in which physical therapists across the country have the unique opportunity to learn from a wide variety of clinical research put forth by various experts in the field. CSM allows for unique interactions with authors and colleagues to exchange ideas, research, as well as ask the questions necessary to ensure optimal treatment is carried out across the profession.

The Occupational Health Special Interest Group (OHSIG) promotes and facilitates professional development through the sharing of current information. The OHSIG is a resource for professionals sharing evidence-based guidelines for practice and the primary resource for physical therapists involved in the promotion of a healthy and productive work force. Working with employment groups, physical therapists are afforded the opportunity to see a wide variety of orthopaedic injuries. Diagnostic skills, as well as treatment philosophy, must be creatively combined to ensure the injured worker can actively participate in work while minimizing the risk of injury.

SCHEDULE NOW TO PARTICIPATE IN THESE EVENTS IN NEW ORLEANS.

OHSIG Membership Meeting:

February 23, 7:00 a.m.-8:00 a.m. Hilton Riverside, St. James Ballroom

Educational Sessions:

Direct to Employer Physical Therapy: Building Supply and Demand Friday

February 23, 8:00 a.m.-10:00 a.m. Hilton Riverside, St. James Ballroom (OHSIG)

Transforming Society: The Role of Physical Therapy in Population Health

(Section on Health Policy & Administration)

ONSITE PHYSICAL THERAPY DRIVEN CORPORATE EMPLOYEE HEALTH AND WELLNESS (PRIVATE PRACTICE SECTION)

Poster Presentations at Combined Sections Meeting

Members of the OHSIG, continue to make significant contributions to this specialty area of practice. Three abstracts in particular, that were chosen by APTA's Orthopaedics Section to be presented at CSM, exemplify the level of skill and clinical decision making necessary to ensure injured workers receive optimal care whether in a traditional outpatient environment or at a work site clinic.

The first abstract that will be presented is, *"Clinical Decision Making With an Undiagnosed Posttraumatic Fracture of Pubic Bone,"* involves a 48-year-old woman having tripped over metal at work and falling onto her buttock. The patient presented with right buttock and posterior-lateral hip pain. Initial x-rays were not taken, which prompted the physical therapist to rely heavily on diagnostic tests and clinical reasoning to determine the likelihood of underlying pathology. Initial evaluation suggested a probable pelvic fracture leading the clinician to confer with the referring physician to order additional imaging, which confirmed the earlier suspicion.

The second abstract that will be presented is, *"The Importance of Physical Therapy During the Healing Process of a Triangular Fibrocartilage Complex Tear with Suspected Nondisplaced Fractures of Triquetral and Capitate Bones,"* This case involves a 37-year-old cell coordinator who tripped over a cable at work and attempted to break his fall and injured his right wrist. Upon initial evaluation, the patient demonstrated signs and symptoms consistent with a triangular fibrocartilage complex tear (TFCC). Unlike most TFCC tears, the patient's range of motion and overall mobility improved greatly throughout the course of physical therapy treatment. However, work-related activities combining twisting, bending, and heavy resistance continued to be problematic. Initial diagnostic testing, clinician experience, and collaboration with the referring physician led to additional imaging. Imaging results designated a specialist would be warranted. Often times, physical therapy is postponed with this presentation; however, the patient began to worsen without treatment. The onsite physical therapist noted the regression and effectively communicated with the injured worker and the injured worker's employer to adjust the plan of care and work activities; ultimately leading to increased patient functional mobility and return to full function.

Finally, the third abstract that will be presented is, *"Clinical Decision Making with an Undiagnosed Cervical Syrinx,"* involves a 43-year-old construction worker that injured his neck during a motor vehicle accident 2 ½ months prior to the physical therapy initial evaluation. The patient was initially taken to the emergency room, where an evaluation was conducted and radiographs were taken. Radiographs were found to be negative for fracture and/or dislocation and the patient was released to return to work. During full work duties, the patient experienced worsening symptoms and was referred to physical therapy. Increased upper extremity numbness, tingling, decreased grip strength, muscle atrophy and a decrease in functional mobility led the treating physical therapist to confer with the referring provider to place a hold on therapy and request further imaging. Had the patient been referred for further care initially, symptoms may not have progressed to a debilitating extent and overall plan of care could have been shortened leading to more efficient and less painful return to work.

All 3 poster presentations demonstrate the amount of diligence diversity and adaptability the physical therapist must display in order to meet the needs of the occupational health population and settings.

President's Letter

Annette Karim, PT, DPT, PhD
Board-Certified Orthopaedic Clinical Specialist
Fellow of the American Academy of Orthopaedic Manual Physical Therapists

CSM IS HERE!

The APTA Combined Sections Meeting will be held February 21-24, 2018, in New Orleans, Louisiana. Many of our members will also be presenting at CSM. We hope to see you there!

Please visit us at the Orthopaedic Section booth when you are at CSM! Don't forget to come to the PASIG Business Meeting and program. We invite you to join us in an active discussion on dancer screening and performing arts fellowships! I have listed pertinent information on each event below.

Performing Arts SIG Membership Meeting

Section: Orthopaedic Section
Date: Saturday, February 24, 2018
Time: 7:00 a.m. - 7:50 a.m.
Location: Hilton Riverside
Room: Grand Ballroom A
Session Type: Section Meeting/Event
CEU: 0

Performing Arts SIG Programming: Athletics Meets Aesthetics: Lower Extremity Injury Treatment in Dance vs. Sport

Section: Orthopaedic Section
Session Code: OR-3A-8870
Date: Saturday, February 24, 2018
Time: 8:00 a.m. - 10:00 a.m.
Location: Hilton Riverside
Room: Grand Ballroom A
Speaker(s): Kornelia Kulig, PhD, PT
Pamela Mikkelsen, PT, DPT
K. Michael Rowley, BS, BA
Hai-Jung (Steffi) Shih, BS, PT
Brooke Winder, PT, DPT, OCS
Session Type: Educational Sessions
Session Level: Basic

Description: This session will examine the commonalities and crucial differences in biomechanics and treatment strategies between dancers and sports athletes. The speakers will present common pathologies of the hip, knee, foot, and lumbopelvic region seen in both dancers and athletes, from pathomechanics to treatment. They also will compare and contrast the factors that lead to these conditions with respect to the different biomechanical demands required in dance styles and sports performance. The treatment strategies must then be altered from traditional return-to-sport rehabilitation programs to accommodate these differences, as well as the strict aesthetic requirements of dance performance. Attendees will learn the fundamental treatment differences along with specific exercise suggestions and progressions. Small-group discussion will follow the panelists' presentations.

Learning Objectives:

Upon completion of this course, the participant will be able to:

1. Discuss the biomechanical demands with performance of typical dance technique and how these differ from sports athletes.
2. Explain the pathomechanics that contribute to common pathologies seen in dancers in the ankle, knee, hip, and lumbopelvic region and compare these to injury mechanisms typically seen in sports athletes.
3. Describe the clinical evaluation for these common pathologies and how assessment will differ between dancers and sports athletes.
4. Apply treatment approaches to address these biomechanical demands while addressing the intrinsic aesthetic demands in dance.

CEU: 0.2

We are looking forward to hearing Dr. Kulig and her team as they received our PASIG grant for research and we are proud of their hard work!

ADDITIONAL MEETINGS AT CSM:

Pre-Professional Dancer Screening Q&A

Section: Orthopaedic Section
Date: Saturday, February 24, 2018
Time: 12:00 p.m. – 1:00 p.m.
Location: Orthopaedic Section Bonus Room
Room: Contact Mandy Blackmon
Session Type: SIG Meeting
CEU: 0

Fellowship Task Force Q&A

Section: Orthopaedic Section
Date: Saturday, February 24, 2018
Time: 1:00 p.m. – 2:00 p.m.
Location: Orthopaedic Section Bonus Room
Room: Contact Laurel Abbruzzese
Session Type: SIG Meeting
CEU: 0

In terms of our ongoing efforts, the PASIG is working on the following:

Mentorship: We have provided and intend to continue to provide mentors to 3rd year student Orthopaedic Section members who are interested in clinical practice and research in the performing arts and orthopaedics. If you are interested in being a mentor, please contact Megan Poll. Megan not only serves as PASIG Secretary, but as the coordinator for the 6-month Orthopaedic Section Mentorship Program: meganpoll@gmail.com

For students interested in becoming a mentee, contact Megan for the upcoming round of applications.

Clinical Sites: We are currently updating the list of clinical rotation sites on our website. Please email Rosie Canizares (rcc4@duke.edu) if you take students and would like your information included on this list.

Membership: We are also trying to keep our membership connected. Please email Liz Chesarek (echesarek@gmail.com) if you are a new member, or want to become more involved as a current member. We would like to know your interests and maintain information to pass on, such as if you can provide backstage physical therapy, if you treat a specific performing arts population, etc. Membership is free to all Orthopaedic Section members.

Member involvement: The PASIG leadership will transition again at CSM. We are grateful for the work done by Andrea Lasner as Nominating Committee Chair, Liz Chesarek as Membership Chair, Laura Reising as Research Chair, Mariah Nierman as Fellowship Task Force Chair, Laurel Abbruzzese as Fellowship Task Force Chair Assistant, Dawn Muci as Public Relations Chair, and Mandy Blackmon as Dancer Screening Chair. We would like to invite you to become involved in leadership and service in the PASIG.

One way to get involved in our leadership is by being part of a committee. Please contact any committee chair if you are interested in serving in a particular area. Students are welcome! We look forward to our incoming leaders, Jessica Fulton, incoming Nominating Committee Chair, Sara Edery-Atlas, incoming Research Chair, and Laurel Abbruzzese, incoming Fellowship Task Force Chair. Stay tuned for new chair appointments and please contact us to serve!

Social Media: To belong to our Facebook page, contact Dawn (Muci) Doran, and please tweet about performing arts with us @PT4PERFORMERS

Dancer Screening: There is an active and growing group of clinicians and academicians interested in sharing pre-professional dancer screens, conducting dancer screening research, and connecting. Contact Mandy Blackmon if you are interested in joining us at CSM. For professional dancer screening, please look at the Dance USA website. Many of us from the PASIG volunteered to provide the Dance USA screen at the 1st Professional Freelance Dancer Health Day in Houston right after IADMS.

Fellowship: The practice analysis re-validation project team is working on final revisions for the upcoming publication of the Description of Fellowship Practice (DFP) for Performing Arts Physical Therapy. The Description of Advanced Specialized Practice (DASP) in Performing Arts Physical Therapy was approved by the ABPTRFE in January 2016. The DFP is currently being reviewed by ABPTRFE. This is the final phase for laying the groundwork for providing current practice guidelines in the sub-specialty area as well as curriculum requirements for Performing Arts PT Fellowships. Contact Laurel Abbruzzese (la110@cumc.columbia.edu) if you are interested in joining us at CSM.

Citation Blasts: If you have a topic of interest and would like to contribute to the monthly e-blast, contact Laura Reising at lbreising@gmail.com.

***OPTP* Submission:** If you have a brief, clinically-focused case report on a performing arts physical therapy patient, or a clinical commentary, please contact me to submit your work: akarim@apu.edu

If you miss CSM, there is the Annual Orthopaedic Section Meeting 2018: The 2018 Annual Orthopaedic Section Meeting will be held in Baltimore, MD from April 26-28, 2018. More information will be posted when available at: https://www.orthopt.org/content/education/2018-annual-orthopaedic-section-mtg

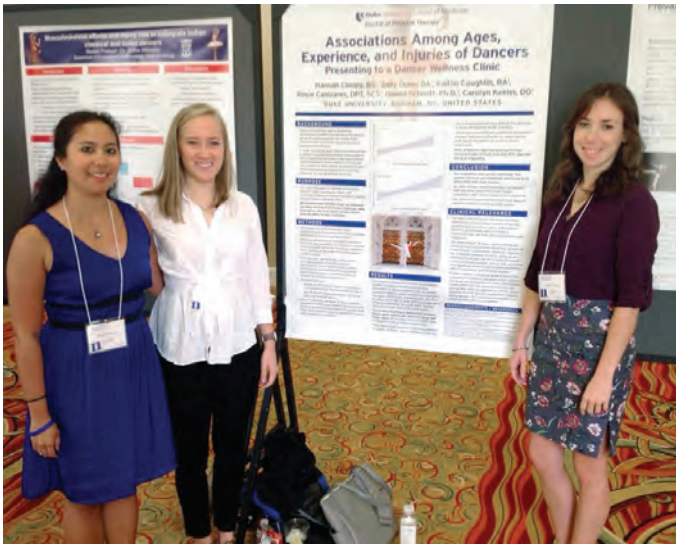
IADMS 2017 Update: The PASIG officers were busy presenting at the International Association of Dance Medicine and Science. The following presentations were given:

IADMS Duels: Dancer – athlete or artist? *Angelina Vera, MD vs. Annette Karim, DPT, PhD*. Interactive workshop: Connecting the dots between dance movement and developmental movement: how a little goes a long way-*Annette Karim, DPT, PhD*. When "healthy" goes too far: the relationship of energy balance and injury in dancers-*Amanda Blackmon, DPT, OCS, Val Schonberg, MS, RD*. Video assessment of countermovement jump performance in first position sauté: a reliability study-*Annette Karim, DPT, PhD*. The effect of a 1-time, 3-hour health promotion workshop on young competitive dancers-*Marissa Schaeffer, SPT, CSCS, Laurel Daniels Abbruzzese, PT, EdD*. Challenges in treating Achilles tendon injuries in the adolescent dancer: a case series-*Jessica Waters, PT, DPT*. Associations among age, experience, and injuries of dancers presenting to a dancer wellness clinic-*Hannah Colopy, BS, Sally Dunn, BA, Kaitlin Coughlin, BA, Rosalinda Canizares, DPT, SCS, Daniel Schmitt, PhD, Carolyn Keeler, DO*. Musculoskeletal effects and injury risk in collegiate Indian classical and ballet dancers-*Roshni Prakash, Blythe Williams, PhD, Michael Granatosky, PhD, Rosalinda Canizares, PT, DPT.* From the dance floor to the pelvic floor: concerns regarding pelvic floor dysfunction in performers-*Brooke Winder, DPT, OCS*. To screen or not to screen-that is the question?-*Laurel Daniels Abbruzzese PT, EdD vs. Sarah Kenny, PhD*. Cryotherapy-help or harm?-*Valerie Williams, PT, PhD vs. Rosalinda Canizares, DPT, SCS*. The effect of Pilates training on the alignment of the pelvis in dancers ages 17-25.-*Elizabeth Ahearn, BFA, MFA, Amanda Greene, DPT, Andrea Lasner, MSPT*.

The PASIG Research Grant Recipients also presented: Lower-limb muscle contributions to relevé in dancers with and without flexor hallucis longus tendinopathy and the effects of unloading the toes. K. Michael Rowley, BS, BA, Hai-Jung (Steffi) Shih, BS, PT, Kristen Sutton-Traina, DPT, Kornelia Kulig, PhD, PT.

We awarded a PASIG student scholarship to attend IADMS. The recipient was Hannah Colopy, student from the Duke University Doctor of Physical Therapy program. Congratulations, Hannah!

PASIG officers behind our booth at IADMS. Laurel Abbruzzese, Fellowship Task Force Chair Assistant/Incoming Chair; Jessica Waters, Nominating Committee Member/incoming Chair; Mandy Blackmon, Dancer Screening Chair; Liz Chesarek, Membership Chair; Brooke Winder, Nominating Committee Member; Annette Karim, President; and Rosie Canizares, Vice President.



PASIG student scholarship recipient to IADMS, Hannah Colopy, BS, with Kaitlin Coughlin, BA, and with faculty mentor and PASIG Vice President, Rosalinda Canizares, DPT, SCS.

OSSIG ORTHOPAEDIC SECTION, APTA

PERFORMING ARTS **LEADERSHIP**

Annette Karim, President	2017-2020	akarim@apu.edu
Lori Michener, Orthopaedic Board Liaison	2017-2020	lmichene@pt.usc.edu
Rosie Canizares, Vice President/ Education Chair	2016-2019	Rcc4@duke.edu
Andrea Lasner, Nominating Committee Chair	2015-2018	alasner1@jhmi.edu
Jessica Fulton, Nominating Committee	2016-2019	jessicafultondpt@gmail.com
Brooke Winder, Nominating Committee	2017-2020	brookerwinder@gmail.com
Elizabeth Chesarek, Membership Chair	2016-2018	echesarek@gmail.com
Laura Reising, Research Chair	2016-2018	lbreising@gmail.com
Mariah Nierman, Fellowship Taskforce Chair	2016-2018	mnierman@orthopedicone.com
Laurel Abbruzzese, Fellowship Chair Asst.	2016-2018	La110@cumc.columbia.edu
Dawn Muci, Public Relations Chair	2016-2018	Dawnd76@hotmail.com
Amanda Blackmon, Dancer Screening Chair	2016-2018	mandydancept@gmail.com
Anna Saunders, Scholarship Chair	2017-2019	annarosemary@gmail.com
Janice Ying, ISC Chair	2017-2019	JaniceYingDPT@gmail.com
Megan Poll, Secretary	2017-2019	meganpoll@gmail.com

OSSIG ORTHOPAEDIC SECTION, APTA | FOOT & ANKLE

FASIG AT CSM – HOPE TO SEE YOU THERE!

As you consider your schedules for the Combined Sections Meeting in New Orleans, here is an early encouragement to attend the FASIG Membership Meeting from 7:00 a.m. – 7:50 a.m. on Thursday, February 22, 2018, where you can get your coffee and be updated on the activities of the FASIG. Immediately following our Membership Meeting, plan to stay in your seat for the FASIG programming titled, "Integrating New Evidence into Plantar Heel Pain Clinical Practice Guidelines," presented by Shane McClinton, DPT, PhD, OCS, FAAOMPT, Stephen Reischl, PT, DPT, PCS, and Sarah Ridge, PhD. This program will begin at 8:00 a.m. Both are sure to be worth the time, as the FASIG leadership will be completing strategic planning work early in the week and will be ready for feedback from the FASIG membership at 7:00 a.m. Then following this session we are excited to hear from a great group that is adding to the current work on plantar heel pain with new research and application to clinical practice.

Both the FASIG Membership Meeting and FASIG programming will be held in the Hilton Riverside Hotel, in the St. James Ballroom.

Do not forget to stay in touch with more announcements and goings-on at CSM by joining our Facebook page (https://www.facebook.com/groups/FASIG).

Thanks and see you all soon in New Orleans!

FASIG Leadership

OS SIG ORTHOPAEDIC SECTION, APTA | PAIN MANAGEMENT

KEEP CALM AND TREAT PAIN

From Research to Clinical Practice

CSM 2018, Preconference Course

February 20–21, 2018 | 8:00AM–5:00PM

Sponsored by the Pain Management Special Interest Group (PMSIG), Orthopaedic Section, APTA

Physical therapists are key to achieving the National Pain Strategy's goal to reduce the burden and prevalence of pain and to improve the treatment of pain. This 2-day pre-conference course will provide you with the latest pain science and evidence-based evaluation and treatment skills you need to successfully treat patients in pain and help meet this national goal. Experts in pain science, pharmacology, psychology, sleep, nutrition, motivational interviewing, mindfulness and mindful movement will share their knowledge and skills. You will have a chance to practice pain evaluation, education and treatment techniques. The role of telerehabilitation to address the needs of patients unable to access physical therapy in person will be included. Case presentations will provide you with clinical reasoning insights and understanding. Join your colleagues for what will surely be an exciting, engaging and dynamic 2 days of learning!

—Presenters—

Kristin Archer, PT, DPT, PhD
Vanderbilt University Medical Center, Nashville, TN

Janet Bezner, PT, DPT, PhD
Texas State University, San Marcos, TX

Stephanie Carter Kelley, PT, PhD, OCS, CYT
Yoga Physical Therapist, Dublin, OH

Dana Dailey, PT, PhD
University of Iowa, Iowa City, IA

Nancy Robnett Durban, PT, MS, DPT
Cincinnati Children's Hospital and Medical Center, Cincinnati, OH

Michelle Finnegan, PT, DPT, OCS.
Bethesda Physiocare, Bethesda, MD

Carolyn McManus, PT, MS, MA
Swedish Medical Center, Seattle, WA
VA Puget Sound Health, Seattle, WA

Megan Pribyl, PT, MS
Olathe Medical Center, Olathe, KS

Catherine Siengsukon, PT, PhD
University of Kansas Medical Center Kansas City, KS

Kathleen Sluka, PT, PhD, FAPTA
University of Iowa, Iowa City, IA

Alexandra Szabova, MD
Cincinnati Children's Hospital and Medical Center, Cincinnati, OH

CSM APTA Combined Sections Meeting
New Orleans • February 21–24, 2018

For further information, see the CSM 2018 website: http://www.apta.org/CSM/

See you in New Orleans!

ORTHOPAEDIC SECTION
LEADERS. INNOVATORS. CHANGEMAKERS.

APTA
American Physical Therapy Association

President's Message

Carolyn McManus, MSPT, MA

January offers the beginning of a new year, and with it, an opportunity to bring new energy to ongoing projects and initiate new ventures. With your help, the PMSIG will bring both new inspiration and innovation to our ongoing activities and pioneer new programs to promote excellence in pain education, treatment, and research by physical therapy professionals in 2018.

The Combined Sections Meeting (CSM) is just around the corner and, once again, pain is popular! The complete list of educational sessions on pain topics is far too long to include here. I encourage you to go to the CSM 2018 website to view the full programming. To spark your interest, among the educational sessions offered on the topic of pain by the Orthopaedic Section are:

- Chronic Pain Epidemic: National Research, Education, and Practice Initiatives (PMSIG programming)
- Transformational Chronic Back Pain Program: PNE Multidisciplinary Approach
- Spotlight on Research: Let's Talk About Pain Studies and Clinical Implications
- The Duplicity of Opioids for the Treatment of Chronic Pain

If you plan to attend CSM 2018, please be sure to come to the PMSIG Business Meeting on Thursday, February 22, from 7:00 a.m. to 7:50 a.m. at the Hilton Riverside in Grand Ballroom A. The PMSIG leadership will experience a transition in Board members based on the results of the November 2017 election and these new PMSIG leaders will be introduced at this time. In addition, Craig Wassinger, PT, PhD, will move from Nominating Committee to the newly established Practice Chair position. Similar to the Research Chair, the Practice Chair is appointed by the PMSIG Governing Board and will serve a 3-year term. At our meeting, highlights from this year's accomplishments will be reviewed, our strategic plan will be introduced, and an opportunity for members to express their views and opinions will be provided. I hope you will join us!

The PMSIG Board and volunteer members have continued to work on initiatives and participate in activities to improve the care of patients with pain conditions. Hopefully you are enjoying and benefitting from our monthly research and clinical pearl emails. Remember, these are catalogued at our website for your review at any time. If you would like to contribute to this initiative, please submit a research topic to Dana Dailey, PT, PhD, at dana.dailey@uiowa.edu or a clinical pearl to me at carolyn@carolynmcmanus.com.

Katie McBee, DPT, OCS, volunteered to join Katherine Beissner, PT, PhD, and Chad Garvey, DPT, OCS, in their efforts to develop a PowerPoint presentation on the topic of pain and its treatment by physical therapists suitable for presenting by PMSIG members at physician and other health care provider professional conferences. We will keep you informed as this project moves forward.

Derrick Sueki, DPT, OCS, Chair of the Orthopedic Specialty Council/PMSIG member, and Kara Gainer, APTA Director of Regulatory Affairs, represented the APTA and Orthopedic Section at the October Integrative Pain Care Policy Congress meeting in San Diego, California. The Congress was comprised of representatives from most of the major health care disciplines including medicine, pharmacy, chiropractic, acupuncture, massage therapy, as well as representatives of Medicare and various third-party payer groups. This Congress was tasked with the important effort of identifying opportunities to collaboratively address the nation's pain management and opioid safety crises. Through this collaboration, the Congress was able to establish a working definition of comprehensive integrative pain management and determined a common message to deliver to legislators and third-party payers that focused on non-pharmacological alternatives to opioid use. Through such collaborative efforts, the APTA, Orthopedic Section, and the PMSIG are focused on promoting the field of physical therapy as one of the foremost experts and an important alternative to opioids in the management of pain.

In addition, I was invited by Joseph Brence, DPT, of the MoveForwardPT.com Editorial Board, to contribute to updating and editing the Physical Therapist's Guide to Chronic Pain Syndromes posted at the APTA's Move Forward website, moveforwardpt.com. I asked Katie McBee, DPT, OCS, and Derrick Sueki, DPT, OCS, to join me in this effort. Be sure to view the final version of this public education resource at the APTA's Move Forward website.

A small group of colleagues is investigating the steps required to establish a Pain Section. You may have received an email inviting you to sign a petition on this topic. Creating a new Section requires proceeding through established APTA protocols and procedures, and should the group decide to move forward, will require a year or two of preparation activities. This group is keeping me informed of their efforts. I will keep you posted on any new developments in the future as they arise.

The Board members and I look forward to working with you in 2018 to improve patient care and advocate our SIG as the leading authority in the role of physical therapy in promoting the healing, well-being, and movement by people with pain conditions. If you have ideas to share or time and energy to offer to PMSIG activities, please contact any Board member. We welcome and appreciate your participation.

I would now like to introduce you to Brett Neilson, DPT, OCS, FAAOMPT. Brett has a Doctorate in Physical Therapy from University of Puget Sound and completed a therapeutic pain specialist certification with the International Spine and Pain Institute (ISPI). He is the Admissions Director for Evidence In Motion (EIM), a clinician at Outpatient Physical Therapy & Rehabilitation Services, Kent, WA, a mentor to residents and fellows, and is an adjunct instructor for the South College PT program, EIM, and ISPI. I want to thank Brett for contributing the following article on an innovative clinical reasoning tool to assist with making treatment decisions for chronic pain patients.

Clinical Reasoning in Treating Chronic Pain: Making "Pain Pies"

Brett Neilson, DPT, OCS, FAAOMPT

More than 100 million Americans are affected by some form of chronic pain,[1] with back pain being the most common musculoskeletal reason patients visit a physician.[2] One in 4 Americans report back pain within the past 3 months and of those 25% will experience recurrent back pain leading to chronicity.[2] As the incidence of back pain is on the rise, many experts believe this increase to be iatrogenic, a result of over examination and poor treatments for pain.[3,4] This increase in persistent pain is associated with increased use, and added burden on health care providers, including physical therapists.

Treating patients in chronic pain can often be an extremely emotional and exhausting experience for any physical therapist. One of the most common themes I hear when talking to new physical therapists and physical therapy residents is that they struggle to treat chronic pain. A recent new graduate described her experience in her first year of practice as "challenging," quoting, "I want to help my patients move better and function better in life, but all they want me to do is get rid of their pain." Assuming the responsibility of taking away someone else's pain is not only stressful and physically and emotionally demanding, it is unrealistic. Could the pressures of treating patients in chronic pain, in turn, be contributing to the reported higher burn out rates in physical therapists who are in the first 4 years of practice?[5] The purpose of this clinical commentary is to discuss the role of clinical decision making in treating chronic pain by highlighting existing research and providing a unique clinical reasoning exercise that can be used by novice and experienced therapists alike to better treat patients with acute to chronic pain.

There are many clinical reasoning models that exist in physical therapy, most originating out of manual therapy "tribes" as frameworks to employ manual therapy techniques to address pain and motion impairments. One similarity that exists in nearly all models is the focus on faulty tissues and joints as the explanation of pain. While manual therapy clinical reasoning models will work for some patients, they do not work for all. In a subgroup of patients, the central nervous system (CNS) becomes hypervigilant and poses significant clinical challenges to the use of active and passive movement strategies to normalize impairments.[6] Further, it is well established that the anatomical and biomedical model to explain and treat chronic musculoskeletal pain falls short, as it fails to explain the complexities of the pain experience beyond the tissues that often leads to distress and disability.[7]

An alternative model, identified and promoted in the National Pain Strategy, is the biopsychosocial model. This model recognizes the role social factors as well as psychological factors, including beliefs, attitudes, and fears, play in a patient's experience of pain. With multiple and complex factors contributing to a patient's pain experience, therapists can be left confused, wondering which treatment approach will be most efficacious for the patient sitting in front of them.

Determining the optimal treatment strategy largely depends on understanding the nature of the patient's pain experience. In order to do this, it is imperative that the physical therapist takes a detailed history; screen for red flags; and performs a thorough, yet low tech physical examination to gain an appreciation for the sensitivity of the peripheral and central nervous systems. It is now well established that a significant part of a person's pain experience is correlated with the vigilance of the central and peripheral nervous systems.[8-10] While this vigilance is not directly measurable in humans, there are current clusters of signs and symptoms as well as indirect measures that may provide insight into the overall function and health of the patient's neural system. In 2007, Keith Smart, began publishing on the clinical reasoning of low back pain (LBP) by experienced physical therapists.[11] This work was developed into a 3-part journal publication in *Manual Therapy* on the mechanisms-based classifications of musculoskeletal pain and provides a structured classification system that can be used to make clinical decisions in determining the primary mechanisms of a person's pain experience. Smart proposed 3 different mechanism based categories--nociceptive, peripheral neurogenic, and central sensitization (Figure 1).

Nociceptive pain refers to pain attributable to the activation of the peripheral receptive terminals of primary afferent neurons in response to noxious chemical, mechanical, or thermal stimuli.[12] A patient with primary nociceptive input driving his or her pain experience will present with proportionate pain to the mechanism and nature of the injury. Patients will describe their pain as an intermittent sharp, dull ache or throb at rest, without reported night pain, dysesthesia, burning, shooting or electric type sensations. When patients are asked about aggravating and easing factors they are able to easily identify specific movements or activities that alter the level of their pain. If they present with these cluster of findings, they are 100 times more likely to have nociception as a large contributor to their pain experience.[12]

Peripheral neuropathic (PN) pain refers to pain attributable to a lesion or dysfunction in a peripheral nerve, dorsal root ganglion or dorsal root arising from trauma, compression, inflammation, or ischemia.[13] A patient who presents with PN input as a source of the pain may have a history of nerve pathology or compromise and will describe pain in dermatomal or cutaneous distributions. During the objective examination, neural dynamic tests will likely be positive and nerve palpation may reproduce familiar symptoms. If the following symptoms are present, the patient is 150 times more likely to have PN input driving the pain experience.[13]

Central sensitization (CS) has been defined as an amplification of neural signaling within the central nervous system (CNS) that elicits pain hypersensitivity.[14] Recognizing and addressing CS can often be challenging for physical therapists because it cannot be directly measured. Based on the work of Smart et al,[14] patients with CS will present with disproportionate pain to the mechanism and nature of their injury, disproportionate aggravating and easing factors (everything hurts and very little helps), and often have several psychosocial issues. On examination, broad diffuse palpation tenderness may be noted. If the following symptoms are present, the patient is 486 times more likely to have a large CS component to their pain experience.[14] Identification of these clusters of symptoms should be an indicator to the physical therapist to further evaluate the hypervigilance of the peripheral and CNS through additional indirect testing including two-point discrimination, pressure pain algometry, and self-report measures such as the Central Sensitization Inventory, Pain Catastrophizing Scale, and Fear-Avoidance Beliefs Questionnaire.

Nociceptive Pain	Peripheral Neurogenic	Central Sensitization
• Proportionate pain • Aggravating and easing factors • Intermittent sharp, dull ache or throb at rest • No night pain, dysesthesia, burning, shooting, or electric pain	• Pain in dermatomal or cutaneous distribution • Positive neurodynamic & palpation tests • History of nerve pathology or compromise	• Disproportionate pain • Disproportionate aggravating or easing factors • Diffuse palpation tenderness • Psychosocial issues

Figure 1.

In addition to Keith Smart's mechanism based classification system, the role of the environment on the patient's pain experience should be recognized. It is well documented that the environment in which the injury occurred as well as the healing environment can play a large role in the recovery outcome.[15,16] Environmental factors can include the work place, home life, social and community participation, the number of medical professional seen, and even the therapy environment. Therefore, it can be said, LBP that occurs at work is not the same as LBP that occurs while at home or during recreation. If there are negative environmental factors that are creating environmental stressors, these too can contribute to the pain experience. Careful questioning to learn more about the patient's environment should also be part of the history taking process.

Recognizing these clusters of symptoms is a great place for clinicians to start in making decisions about the course of care for their patients. The first question to ask, is the patient's pain a tissue issue or a pain processing issue? Breaking pain down to its simplest form of a dichotomy can often be a great way for a clinician to build confidence in understanding a patient's pain experience. Most patients have both tissue issues and pain processing issues that will need to be addressed through appropriate treatment strategies. This then leads to the next question, which mechanism is driving the patient's pain experience? An exercise that can be used for each patient is to draw a "pain pie" to represent the contributing factors of the patient's pain. A pain pie is drawn in the form of a pie chart to create a visual of a person's pain experience. Based on the cluster of signs and symptoms the therapist will make an assessment of the amount of each contributing category (nociception, PN, CS, and environment) to the patient's pain experience. This can be done by listing the cluster of signs present under each category to determine the representation of each piece of the pain pie. For example, the patient with an acute LBP injury will likely present with a cluster of signs most fitting of the nociception category as shown in the left pain pie of Figure 2. However, some clinical signs may exist for other categories as well making them a smaller proportion of the pain experience. For a patient with chronic LBP, he or she may present with a cluster of signs more similar to CS as shown in the right pain pie of Figure 2. They are also likely going to have larger contributions of environmental factors and may also have signs of peripheral neurogenic as well as nociceptive contributions to the pain experience.

Drawing a pain pie can help the therapist visualize the nature of the patient's pain experience. When selecting interventions, it will be important to place an emphasis on addressing the largest piece of the pie in the treatment planning but it will also be important to include interventions to address the other contributors to the pain experience. Direct evidence does not exist to suggest which interventions are best for each category. This may be an excellent direction for future research. Based on clinical experience for nociceptive pain, evidence-based interventions should be employed to address nociceptive issues at the tissue level. These may include manual therapies, exercise, and other traditional therapies to address the impairments of body structures and functions. For peripheral neurogenic mechanisms, consider evidence-based interventions to unload the peripheral neural tissues including traction, positioning, and neural dynamic techniques. For CS, the focus is on lowering the vigilance of the CNS. Evidence-based interventions such as psychologically-informed physical therapy, pain neuroscience education, cognitive behavioral therapy, graded activity, breathing activities, relaxation exercises, and motor imagery interventions may be used. Finally, environmental factors can be addressed through education and working through strategies to alter the environment as able. If the patient is not responding to treatment, perhaps the treatment focus does not match the pain pie.

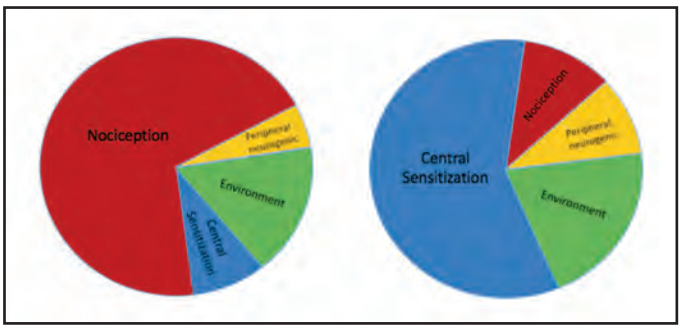


Figure 2.

Treating patients with chronic pain is likely the most challenging patient population that physical therapists work with. Having a framework to recognize clinical patterns can assist in identifying the contributing mechanisms to a person's pain experience. With an increased knowledge of the nature of a person's pain experience, physical therapists can have a better appreciation for the patient's pain and select treatment interventions that are best suited to the nature of the patient's condition.

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CLINICAL IMAGING

Independent Study Course 27.3

Learning Objectives

1. Describe the importance of having physical therapists study imaging.
2. Identify relevant anatomy on diagnostic images.
3. Define the different types of musculoskeletal imaging and the distinguishing information gathered from each.
4. Understand basic radiographic terminology and the basic principles of radiography.
5. Discuss factors that influence resolution, quality, and interpretation of imaging.
6. Discuss basic viewing strategies for plain film, computed tomography, and magnetic resonance images.
7. Discuss differences among and indications for various imaging methods and modalities.
8. Understand the clinical decision making model for determining image sequence using American College of Radiology-Appropriateness Criteria and other clinical prediction rules.
9. Understand the use of evidence-based guidelines for application of imaging modalities for musculoskeletal disorders of the extremities.
10. Discuss the imaging findings for musculoskeletal disorders of the spine and extremities in the context of clinical presentations of patients.
11. Identify signs and symptoms of red flags and specific causes of spine pain that require emergent referral and/or immediate imaging.
12. Appropriately refer patients with acute and chronic spinal disorders for diagnostic imaging based on clinical practice guidelines.
13. Synthesize available patient examination findings with imaging evidence to develop more effective intervention strategies.

Topics and Authors

Basic Diagnostic Imaging Principles
Ira Gorman, PT, PhD

Imaging of the Extremities
Deepak Kumar, PT, PhD, OCS
Amee L. Seitz, PT, PhD, DPT, OCS

Spinal Imaging: Update for the Treating Physical Therapist
J. Megan Sions, DPT, PhD, OCS
James Elliott, PT, PhD
George J. Beneck, PT, PhD, OCS, KEMG
Charles Hazle, PT, PhD

Description

This monograph series covers an introduction to the basic principles underlying the science and diagnostic utility of imaging for the physical therapist. The first monograph is a primer that discusses principles of conventional plain film radiographs (x-rays); computed tomography (CT) scans, magnetic resonance imaging, ultrasound imaging; diagnostic ultrasound and rehabilitative ultrasound imaging; and nuclear imaging. The second and third monographs cover imaging for the extremities and spine and its role in the evaluation of select musculoskeletal injuries. Application of the material is enhanced through the presentation of case studies.

Continuing Education Credit

Fifteen contact hours will be awarded to registrants who successfully complete the final examination. The Orthopaedic Section pursues CEU approval from the following states: Nevada, Ohio, Oklahoma, California, and Texas. Registrants from other states must apply to their individual State Licensure Boards for approval of continuing education credit.

Course content is not intended for use by participants outside the scope of their license or regulation.

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ORTHOPAEDIC SECTION
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FUTURE CSM PROGRAMMING

We welcome your ideas for programming to serve our members and the profession at the Combined Sections Meeting (CSM). Each special interest group of the Orthopaedic Section is allotted two hours of programming time at CSM. We have often used that time for technical content for imaging or for recommendations on teaching imaging with integration into clinical reasoning. Our programming for CSM 2018 is a significant change from the past and now has a strong orientation on advocacy at the local level along with information about APTA's long-term view and strategy. If you have not been involved with proposal development previously, the lead time for CSM proposal submissions is approximately 11 months prior to the event. With CSM 2019 being January 23-26 in Washington, DC, any programming proposals need to arrive to one of the SIG officers by mid-February 2018. Even if your proposal is not in time for this year, the invitation for suggestions remains open for future meetings and conferences.

CSM 2018 PROGRAMMING

The SIG sponsored programming for the upcoming CSM is titled "Referral for Imaging in Physical Therapist Practice: A Pragmatic Vision." This is a team presentation directed at advocacy on the local level in the context of the national picture. The speakers will cover issues on imaging from institutional, state, and national levels since imaging as a part of physical therapist practice continues to evolve. The speakers will include Bill Boissonnault, Aaron Keil, Scott Rezac, Marcus (Kip) Schick, and Angela Shuman—all of the speakers bring noteworthy experience and expertise relating to state and national strategies. Please encourage the leadership in your state association to attend this session.

We also have planned a preconference course, "Achieving Clinical Correlates—Imaging Implications for Physical Therapists" to be held Wednesday, February 21, 2018. This is a one-day course covering the essential technical and professional issues with imaging in physical therapist practice now and in the future. The presenters include Bob Boyles, Jim Dauber, Brian Young, and Chuck Hazle. For those of you who cannot make CSM, check out ISC 27.3, Clinical Imaging recently published by the Orthopaedic Section. Details can be found at: https://www.orthoptlearn.org

MAKING CONNECTION

One of the challenges APTA, the Orthopaedic Section, and the Imaging SIG encounters is sustaining contact with their members. The first line and most common form of communication is e-mail. We have observed and have experienced that e-mail does not always find its way to the intended recipients. Spam filters and firewalls often cannot discriminate the friendly mass e-mails from the undesirable correspondence. As such, our intended communications often do not reach all of our members. One measure that can assist in this issue is to save the Orthopaedic Section's domain in your safe senders list or contact list. Most of the email from the Orthopaedic Section and SIG will have the sender's address of tfred@orthopt.org –please save this into your contacts and/or your safe senders list or a similar category for your e-mail program. This will increase the likelihood of correspondence from the Section and the SIG actually reaches you. Occasionally checking your spam or junk folders may also be helpful.

ULTRASOUND EDUCATIONAL GUIDANCE

Recently, we posted information on the application and testing procedures for the RMSK (Registered in Musculoskeletal Sonography) credentials to the Imaging SIG pages on the Orthopaedic Section's website. Concurrent with that has been a rising number of queries through the Section on ultrasound imaging in clinical practice and how to seek training. We are gathering information to publish a guide document for ultrasound education with recommended resources to also add to the SIG's webpages. Please stay tuned for this information, particularly if you have an interest in becoming skilled in using ultrasound imaging as a component of your clinical practice.

IMAGING SIG INAUGURAL SCHOLARSHIP

The first Imaging SIG Scholarship will be awarded at CSM in New Orleans. This scholarship is intended to raise the level of visibility of the SIG and reward those who are undertaking scholarly activities in imaging as a part of physical therapy practice. Please spread the word of the availability of this scholarship to your colleagues and anyone with whom your work or communicate. For CSM 2019, applications will be considered after acceptance of proposals is determined. The link to the description of the scholarship and the application process can be found at: https://www.orthopt.org/content/special-interest-groups/imaging/imaging-sig-scholarship

COLLABORATIVE EDUCATIONAL EFFORTS WITH AIUM

In recent months, we have established a productive relationship with the American Institute for Ultrasound in Medicine (AIUM). Two of our members have presented in AIUM sponsored webinars--the first time physical therapists have been featured in AIUM's educational programming. On August 3, 2017, Mohini Rawat, DPT, ECS, OCS, RMSK, presented "AIUM/APTA Webinar: Value of Ultrasound Imaging in Peripheral Nerve Pathology." This webinar remains available on AIUM's YouTube channel and their website (http://www.aium.org/). More recently, the Women's Health and Orthopaedic Sections (with the Imaging SIG) organized the webinar entitled "AIUM/APTA Webinar: MSK Real-Time US in Women's Health & Orthopaedic Physical Therapy Practice" on Tuesday, November 14, 2017, as presented by Carrie Pagliano, PT, DPT, OCS, WCS, MTC, and Megan Poll, PT, DPT, OCS. The recording of this event is also archived. We anticipate that physical therapists will be involved with AIUM's educational efforts on a regular basis from this point forward. This is a noteworthy development for the SIG, APTA, and the profession at-large in that we are now being recognized for being content experts in US imaging in what has been predominantly physician-based educational programming.

ORFSIG MEMBERS,

First, I want to thank all of those who ran for our first ever election and appreciate all of you who went out and voted. As a result of these efforts, it is my pleasure to announce our new leaders of the ORFSIG.

President: Matt Haberl, DPT, ATC, CSCS, OCS, FAAOMPT
VP/Ed Chair: Kathleen Geist, PT, DPT, OCS, FAAOMPT
Nominating Committee:

- 1-year term: Matt L. Stark, PT, DPT, FAAOMPT, OCS
- 2-year term: Melissa Dreger, PT, DPT, OCS
- 3-year term: Mary Derrick, PT, DPT, OCS, FAAOMPT

As you all know the annual Combined Section Meeting (CSM) is just around the corner. This year we head to "The Big Easy" of New Orleans, LA. The ORFSIG will kick off the CSM with our **Pre-con Course–"Trust in Your Thrust" on Wednesday, February 21st at 8:00 a.m.** Please help fill this course with promotion to your interested students, new grad or any of your residents looking for some additional hands on manual therapy practice. We will also be talking with interested potential residents about the advantages of residency and fellowship education.

This CSM will mark yet another busy year for Residency and Fellowship Education. One key item will be our first official meeting as a Special Interest Group with our newly elected officers.

Save the Date:

- **Friday, February 23rd at 7:00 a.m. for our ORFSIG Business Meeting**
  - o New Orleans Ernest N. Morial Convention Center Room 224.

Other important events at CSM to put on your schedule include:

- **Thursday, February 22nd**
  - o **8:00 a.m.** Education Section Residency and Fellowship SIG Meeting
    - New Orleans Ernest N. Morial Convention Center **Room:** 224
  - o **1:50 p.m.** Sports Section Residency and Fellowship Education SIG Meeting
    - New Orleans Ernest N. Morial Convention Center **Room:** 217
- **Friday, February 23rd**
  - o **6:45 a.m.** Academy of Neurological PT Residency Collaboration Breakfast
    - Hilton Riverside–Room: Grand Ballroom D
  - o **7:00 a.m.** Residency/Fellowship Accreditation Management System Overview
    - New Orleans Ernest N. Morial Convention Center **Room:** 214
      - **Please note–this does run simultaneous to our ORFSIG meeting but is intended to be a demonstration only. Programs will be able to get individualized assistance as needed once this program is available per Kendra Harrington of ABPTRFE.**
  - o **2:00 p.m.** Oncology Section Residency program networking
    - Hilton Riverside Room: Cambridge

OTHER BUSINESS

1. ***ABPTRFE release of FAQs and Crosswalk documents to provide direction with the new Quality Standards.***
   a. The ORFSIG will be meeting alongside the other Residency and Fellowship Leadership at CSM this year. Please provide any thoughts or questions regarding these forms or other questions with the new Quality Standards.
2. ***Website Development:*** Check out our new website! Here we will have resources to ORFSIG meetings, ABPTRFE updates, curriculum packages, grants, etc. This will be our HUB of information for both current programs as well as developing programs.
3. ***ABPTRFE New Quality Standards including a Descriptions of Residency Practice- Orthopedics discussion with Practice Committee.***
   a. ORFSIG is working with the Practice Committee Chair regarding concerns about new requirements for residency and fellowship programs to adhere to specific patient populations and patient diagnoses to maintain accreditation. Several programs have reported concern regarding the new reporting standards to go into effect January 2018.
4. ***Education Section Residency and Fellowship Special Interest Group (RFSIG) Collaboration***
   a. RFSIG HUB: Has created a location for discussion across Residency/Fellowship (R/F) education for communication regarding curriculum, mentorship, and shared resources. Programs however must be members of the Education Section RFSIG to engage in discussion. We are working on a more simplistic way for program discussion as the ORFSIG communication Facebook platform is limited to individuals with Facebook profiles. Here is a link to the Education Section RFSIG HUB.
      i. Link: http://communities.apta.org/p/co/ly/gid=202
   b. ***RFSIG Think Tank:*** The RFSIG is trying to organize key members to assist in ideas for curriculum development, mentorship, and research from each Section. The ORFSIG and Residency/Fellowship Representative – Molly Malloy attended the first meeting at the Education Leadership Conference and will be assisting with areas of curriculum development. Stay tuned for more to come on this.
   c. ***Residency and Fellowship Specific Webinars:*** The first Webinar was held by the RFSIG at the beginning of October. Kris Porter of the ORFSIG was able to attend and assist in additional discussion regarding mentorship. This course was provided to also assist developing mentors from the APTA Course titled: "Successful Mentorship." We will continue to work with Carol Jo Tichenor, Vice President of the RFSIG in developing an online discussion board for R/F education.

5. ***OPTP Quarterly Submissions:*** We had our first Case report submitted to *OPTP* to highlight R/F work. We look forward to future submissions.
   a. *Please submit Case Reports/research to Kimberly Bennett via* kbennett@u.washington.edu. *Further information regarding OP Case Report submissions can be found on our Facebook page and on the Orthopaedic Section website at: https://www.orthopt.org/content/membership/publications*
6. ***Strategic Planning:*** We will focus on strategic planning following elections to continue the progression of the ORFSIG.

We hope everyone can make it to the ORFSIG Meeting This meeting will be one of many to come to review and discuss our strategic planning for the future of the SIG. Looking forward to seeing all of you in New Orleans!

Matt Haberl
Chair, ORFSIG

President's Message

Kirk Peck, PT, PhD, CSCS, CCRT, CERP

CSM New Orleans - Big 20th Anniversary!!

You read the heading correctly…20 years have passed since the Animal Rehabilitation SIG was officially recognized by the Orthopaedic Section, APTA. Many changes have occurred since the original founders of the SIG achieved success in starting the organization in 1998. Their goal, what must have seemed like a crazy idea, was to promote the involvement of physical therapists to treat animals. Their hard work and perseverance has paid off. Today the profession of physical therapy continues to experience solid growth in the number of physical therapists finding interest in expanding the variety of clients they treat.

So please join me and others in celebrating this momentous occasion during the SIG Business Meeting, Saturday, February 24th from 7:00 a.m. - 8:00 a.m. Check APTA's CSM schedule online for details on room location. Also, please remain after the Business Meeting to enjoy the SIG's two-hour programming on managing neuro-related pathologies in the canine client by using the theory and concepts of PNF and NDT, presented by Jeanine Freeberg, PT, DPT, C/NDT, and Amie Lamoreaux Hesbach, PT, DPT, MS, CCRP, CCRT.

Animal Rehabilitation SIG Hits A Home Run At Regis University, Denver, Colorado

In this edition of *OPTP*, the ARSIG has provided an exciting article highlighting a recent educational course hosted by Regis University in Denver, Colorado. I invite you to read the article and enjoy for yourself as we continue to celebrate an ongoing interest in an expanding consumer market for physical therapists.

ARSIG Practice Analysis Survey Update

Progress is being made on analyzing data from the ARSIG animal practice survey. The plan is to unveil a few preliminary findings from the survey during the CSM Business Meeting but then finalize the study in the spring 2018. The ultimate goal is to create the first ever description of practice for animal rehabilitation.

PART II: PTs Treating Animals – Standardized Competencies of Education

In the previous edition of *OPTP*, I discussed why it is important for physical therapists to first become *"species competent"* before venturing into animal rehabilitation. To support my position, I highlighted several key differences between human, horse, and dog anatomy.

If you read the article in *OPTP*, it should have been clear that no two species are alike when it comes to anatomical structures. Likewise, it should be of little surprise to learn that no two species share identical physiologies, pathologies, biomechanics, or differential diagnoses. So what then constitutes minimal educational requirements for physical therapists to treat animals considering the vast amount of required additional competencies? The simple answer is that to date *no standardization* of education exists specific to the art and science of animal rehabilitation.

In the United States, and a few other select countries, continuing education opportunities are available for physical therapists to acquire additional competencies to treat animals. However, as a general rule, they are non-accredited certificate or diploma programs. Non-accredited means these programs are not officially recognized by any formal governmental agencies that typically accredit various academic programs of study and institutions of higher education. Lacking official accreditation status, the educational content offered through certificate programs remains legitimate only to the extent of the qualifications of faculty teaching the course work, the quality and depth of curriculum, and integrity of the business entities administering the certificates of completion. This is true not only for courses in animal rehabilitation but for all continuing education suitable for enhancing the practice of physical therapy.

Herein exemplifies the importance of why the ARSIG is presently conducting a formal practice analysis. The goal is to determine commonly agreed upon competencies for physical therapists to practice animal rehabilitation. This is the first step toward creating more formal models of educational standards. In turn, a detailed description of animal practice will help to inform future educational advancements as they continue to emerge within the profession of physical therapy. In the meantime, it is imperative that physical therapists obtain advanced competencies if they desire to treat animals as part of practice. Acquiring additional knowledge and skill is a minimal expectation of demonstrating professional integrity and assurance that physical therapists can and will provide collaborative care to animals using safe handling techniques and sound clinical reasoning in the provision of services.

Contributory Acknowledgment

In this edition of *OPTP*, Lisa Bedenbaugh shared her reflections on the Introduction to Canine Rehabilitation course held last September in Denver, Colorado. Please enjoy as you usher in the New Year.

Hum…I Wonder If They Ever Found Those Yummy Christmas Ornaments!!

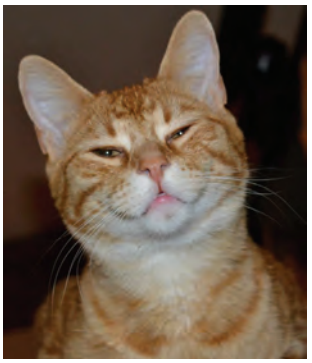


Photo of "Tiger," Courtesy of Christy Jepsen, Creighton University

Contact:
Kirk Peck, President ARSIG
Office (402) 280-5633
Email: kpeck@creighton.edu

ARSIG Introduction to Canine Rehabilitation Course

Regis University, Denver, Colorado

Lisa Bedenbaugh, PT, CCRP

The Animal Rehabilitation Special Interest Group (ARSIG) recently presented a 2-day "Introduction to Animal Rehabilitation" Course at Regis University, in Denver, Colorado. The course was September 9-10th, and was very well attended. We had 46 participants, most of whom were physical therapy students, but there were also several licensed physical therapists who wanted to learn more about this exciting field of practice.

Day one started out with a talk on "Basic Canine Anatomy," presented by Cheryl Rigger-Krugh, PT, ScD, MS, who discussed the similarities and differences in human versus canine anatomy. Cheryl provided a good framework for the students' understanding and for the other topics discussed during the weekend. The next presentation was on "Common Conditions," presented by Charles Evans, PT, CCRP, and Lisa Bedenbaugh, PT, CCRP. Charles reviewed the most common orthopedic cases that a rehabilitation therapist encounters, including hip and elbow dysplasia, fractures, and other orthopedic issues. Lisa lectured on common neurological cases, including intervertebral disc disease, fibrocartilaginous emboli, degenerative myelopathy, and peripheral nerve injuries. Lisa also lectured on "Evaluation of the Canine Rehabilitation Patient," outlining the main areas of interest to an animal therapist, including the history, palpation, range of motion testing, gait training, special tests and measures, physical assessment, and creating plans of care.

The students and speakers were treated to a fantastic lunch by our major sponsors who helped support this course, then the afternoon kicked off with a dynamic presentation on "Introduction to Equine Rehabilitation," by Kirk Peck, PT, PhD, CSCS, CCRT, CERP. Kirk illustrated how physical therapists trained in equine therapy can not only assist the horses with orthopedic and neurologic issues, but also manage issues specific to the riders. Often, the horse and rider will have conflicting dysfunctions, as the horse will have to compensate for an asymmetric rider, and vice versa. So physical therapists possess a unique skill set enabling them to address biomechanical dysfunctions arising from both species. Following the equine presentation, the students separated into several groups, and were able to palpate and perform basic evaluation skills on volunteer dogs, provided by the Service Dog training program at Regis. Each group had an ARSIG member as a mentor to guide them through organized lab sessions.

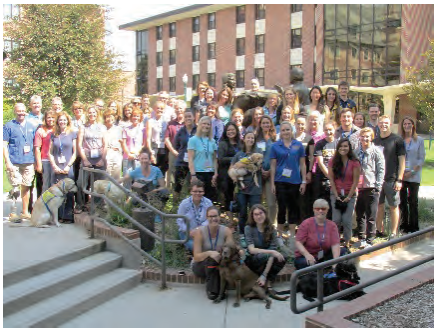
The morning of day two was devoted to topics regarding neurological issues and appropriate treatment strategies. These lectures were provided by Amie Hesbach, DPT, CCRP, CCRT, and consisted of educating students in basic canine neuroanatomy, and illustrating different neurological cases and treatment strategies. A special focus was placed on using concepts of NDT, and discussing principles of motor control and learning, and how these play a role in canine rehabilitation.

Following another delicious lunch, the afternoon session began with lectures related to treating the canine athlete and common injuries seen with the sporting and working dog. These lectures were provided by Ria Acciani, PT, CCRP, and included discussion on several manual therapy techniques and palpation skills used to evaluate and treat dogs. The rest of the afternoon was devoted to lab time, where participants were again guided through palpation for soft tissue and joint restrictions, evaluating gait, and neuromuscular control.

The ARSIG would like to thank all of those who helped make this course at Regis a success: Tara Fredrickson, Orthopedic Section, APTA, who provided administrative assistance and helped to keep things organized; Regis University, for hosting the course in their physical therapy department; the Service Dog training program at Regis, who provided the volunteer dogs used during the lab and demonstration sessions; our major sponsors- Spectravet-Hero Braces-Sound-and Hudson, and Jeff Maier from Rapid Release Technology for providing lunch and other support for the course; and our other sponsors-Help em Up and Toe Grips, for providing products-in-kind. This course was well-received and a lot of fun for both the students and speakers. The ARSIG is now seeking new venues in various parts of the country to provide similar courses in 2018 and beyond. We welcome any SIG member interested in assisting our group in helping to organize and plan for future courses. If interested, please contact Kirk Peck (kpeck@creighton.edu), Stevan Allen (stevanallen@gmail.com) or Lisa Bedenbaugh (lhinerman2@aol.com).

Attendees enjoying an engaging lecture on canine rehabilitation.

Course Instructors: Front row left to right: Cheryl Rigger-Krugh, Linda McGonagle, Charles Evans, Lisa Bedenbaugh, Ria Acciani, Karen Atlas. Back row left to right: Kirk Peck, Stevan Allen, Carrie Adrian, Amie Hesbach.



Course attendees outside Regis University, Denver, Colorado.

Call for Papers

ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The Editors of *Orthopaedic Physical Therapy Practice (OPTP)* invite and welcome Section members to consider authoring and submitting papers for publication to *OPTP*.

OPTP serves as a publication option for articles pertaining to clinical practice as well as governance of the Orthopaedic Section and corresponding Special Interest Groups (SIGs). Articles describing treatment techniques as well as case studies, small sample studies, and reviews of literature are acceptable. Papers on new and innovative technologies will also be considered for publication.

More information and the Instructions for Authors can be found at:
https://www.orthopt.org/content/membership/publications

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PROPOSED NAME CHANGE

(Continued from page 47)

- Academy of Pediatric Physical Therapy

Will Section members have an opportunity to provide feedback? Yes, during the Annual Section Membership meeting at Combined Sections Meeting (CSM) 2018, members will have an opportunity to discuss the proposed name change. Following the discussion, a vote will be taken to adopt the proposed amendment. In order for any proposed amendment to be adopted, the Section must receive by the deadline valid ballots from at least five percent (5%) of the eligible voters and at least two thirds (2/3) of the valid ballots must contain a vote in favor of the proposed amendment. It will be important to have a robust number of members present at the 2018 Annual Section Membership meeting to participate in the discussion and vote on the amendment.

How will the name change be approved? The name change will require three main steps:

1) A vote by membership to approve the bylaw amendment,
2) A vote by the APTA Sections to endorse the name change, and
3) Approval by the APTA Board of Directors

Once the above steps are complete, the Section will provide updates to the membership and branding material will be updated.

POSTOPERATIVE MANAGEMENT OF ORTHOPAEDIC SURGERIES

Independent Study Course 27.1

Learning Objectives

1. Describe anatomy of the hip joint and how structure can relate to pathological conditions.
2. Describe indications for surgical intervention and select surgical procedures of the hip.
3. Describe postoperative rehabilitation intervention techniques following hip surgery.
4. Know the common structures and pathomechanics involved in knee injury.
5. Describe the physical therapy guidelines, phases, and goals for a patient who has undergone knee surgery.
6. Understand the etiology of a calcaneal fracture, Lisfranc fracture/dislocation, and an Achilles tendon rupture.
7. Identify the advantages and disadvantages of surgical fixation versus closed treatment for calcaneal fractures.
8. Develop appropriate treatment plans for patients who have sustained a calcaneal fracture, Lisfranc fracture/dislocation, or an Achilles tendon rupture.
9. Synthesize the current evidence comparing conservative care versus early surgery in different subgroups of patients with cervical and lumbar spine pain.
10. Identify the clinical findings that identify patients who are most likely to benefit from cervical or lumbar surgical intervention.
11. Screen and appropriately manage postoperative complications for presented pathologies.
12. Develop an evidence-based rehabilitation program for patients who have undergone different cervical and lumbar surgeries.
13. Integrate biomechanics and pathomechanics of the shoulder to evaluation and treatment.
14. Implement evidence-based nonoperative treatment strategies for shoulder pathology.
15. Describe evidence-based rehabilitation guidelines following shoulder surgery.
16. Understand the anatomy and biomechanics of the elbow complex and how it relates to surgical interventions, tissue healing, and treatment.
17. Understand postoperative guidelines and treatment progression for the elbow complex.
18. Apply appropriate patient-reported outcome measures for select surgical procedures of the hip, knee, ankle/foot, spine, shoulder, and elbow.

Editorial Staff

For Registration and Fees, visit orthoptlearn.org
Additional Questions—Call toll free 800/444-3982

Description

This 6-monograph course covers postoperative management for injuries and pathology of the hip, knee, ankle/foot, cervical/lumbar spine, shoulder, and elbow. Each monograph addresses the anatomy and biomechanics of the structure, a review of select or common injuries, and nonsurgical and surgical management. Emphasis is placed on rehabilitation guidelines, precautions and contraindications to care, and also expected outcomes.

Topics and Authors

Hip—Keelan Enseki, PT, MS, OCS, SCS, ATC, CSCS; Dave Kohlrieser, PT, DPT, OCS, SCS, CSCS; Craig Mauro, MD; Michaela Kopka, MD, FRCSC; Tom Ellis, MD
Knee—Michael J. Axe, MD; Lynn Synder-Mackler, PT, ScD, FAPTA; Anna Shovestul Grieder, PT, DPT, OCS; Jeff Miller, PT, DPT, OCS, SCS; Melissa Dreger, PT, DPT; Michael Palmer, PT, DPT, OCS; Tara Jo Manal, PT, DPT, OCS, SCS, FAPTA
Ankle and Foot—Stephanie Albin, DPT, OCS, FAAOMPT; Mark Cornwall, PT, PhD, FAPTA; Drew H. VanBoerum, MD
Cervical and Lumbar Spine—Paul Reuteman, PT, DPT, MHS, OCS, ATC
Shoulder—Brittany Lynch, PT, DPT, SCS, OCS; Heather Christain, PT, DPT, SCS, OCS, CSCS; Christopher L. McCrum, MD; Dharmesh Vyas, MD, PhD
Elbow—Julia L. Burlette, PT, DPT, OCS; Amy B. Pomrantz, PT, DPT, OCS, ATC; Chris A. Sebelski, PT, PhD, OCS, CSCS; Justin M. Lantz, PT, DPT, OCS, FAAOMPT; John M. Itamura, MD

Continuing Education Credit

Thirty contact hours will be awarded to registrants who successfully complete the final examination. The Orthopaedic Section pursues CEU approval from the following states: Nevada, Ohio, Oklahoma, California, and Texas. Registrants from other states must apply to their individual State Licensure Boards for approval of continuing education credit.

Course content is not intended for use by participants outside the scope of their license or regulation.

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APTA
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Orthopaedic Physical Therapy Practice
2920 East Avenue South, Suite 200
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ORTHOPAEDIC
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